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CONTENTS

ELECTRIC RAILWAY TRACTION

A Supplement illustrating and describing developments in Electric Railway Traction is presented with each copy of this week's issue.

Limiting Transport Development

WHAT practical limit to transport development is set by our present attainments in engineering and engineering materials was the question asked—and answered—by Sir Alexander Gibb in his presidential address last Monday to the Institute of Transport. As the summary we give on page 654 indicates, Sir Alexander discussed only the most difficult phases of engineering which are still in process of development. He showed just how far mankind can burrow into the depths of the earth for tunnels and bridge foundations, and to what extent it is possible to provide ventilation for such works. To enterprises of this kind engineering limits seem to be set, but there is no prospect of any need yet even to approach them. The developments in materials and their application to the superstructure of bridges, too, remove obstacles to the achievement of those ideals of speed and economy which Sir Alexander held to be the goal of transport. Fog and darkness, long limiting factors in transport by sea and air, are now being stripped of their terrors by the rapid development of aids to navigation. What has already been done in the short time since man first flew, seems to point to there being practically no bounds to the possibilities of achievement in the air. In shipping and railways, although development may not be rapid, engineering knowledge is still ahead of requirements; and even in the adaptation of roads to modern traffic, there is nothing the engineer cannot accomplish if the restraining influence of finance—a psychological, not a real, restraint—is removed. The limiting factor in the solution of transport problems, as Sir Alexander Gibb conclusively showed, is certainly not the ability of the engineer to discover sources of energy and apply them for the service of man.

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Twenty-eight Weeks' Freight Traffics

Freight traffics of British standard-gauge railways for the 28 weeks ended July 10, 1937, are summarised in the recently-published Ministry of Transport statistics for the month of June, 1937. They show on the whole a rise of 6·16 per cent. in tonnage and of 4·95 per cent. in receipts compared with the corresponding period of 1936. Higher class merchandise tons were 27,959,884, an increase of 1,831,586 tons or 7·01 per cent., with receipts of £22,895,089, which were higher by £975,517 or 4·45 per cent. Of minerals and merchandise (Classes 1-6) 30,877,676 tons were conveyed, an advance of 1,480,015 tons or 5·03 per cent., and the receipts of £7,886,568 showed an increase of £159,225 or 2·06 per cent. Coal class tonnage was 101,298,023, an improvement of 6,065,984 tons or 6·37 per cent., and in the receipts of £18,931,159 the gain was £1,262,029 or 7·14 per cent. Livestock receipts at £650,239 were down £22,720 or 3·38 per cent. During the four weeks ended July 10, 1937, merchandise and coal receipts advanced more rapidly. The figures for higher class merchandise were £3,353,661, an increase of £177,300 or 5·58 per cent. Minerals and merchandise (Classes 1-6) brought in £1,188,963, an improvement of £95,743 or 8·76 per cent., and in the coal class receipts of £2,404,177 the gain was as much as £250,882 or 11·65 per cent.

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The Week's Traffics

For the past week the combined traffic increase of the four main line companies was £135,000, against an increase of £146,000 for the previous week in which the new tariffs were in operation for 3 days on the L.M.S.R., G.W.R., and Southern and for two days on the L.N.E.R. Part of the increase in the previous week was probably due to a rush of traffic to take advantage of the old scale of charges. The 40 weeks of the current year have produced earnings of £126,754,000 for the four companies, making a gain of £5,272,000 or 4·34 per cent. Coal traffics have shown the largest percentage increases.

	40th Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R. ..	+ 26,000	+ 19,000	+ 12,000	+ 57,000	+ 1,949,000	+ 3·97
L.N.E.R. ..	+ 19,000	+ 9,000	+ 11,000	+ 39,000	+ 1,692,000	+ 4·76
G.W.R. ..	+ 6,000	+ 11,000	+ 7,000	+ 24,000	+ 1,044,000	+ 5·13
S.R.	+ 13,000	+ 1,500	+ 500	+ 15,000	+ 587,000	+ 3·56

Mersey Railway receipts for the past week showed an increase of £40, and the total for the 40 weeks is £167,232, an improvement of £5,150.

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"Permanent Way"

As we have previously pointed out, there is little doubt that the use of the term permanent way (comprising rails, chairs, sleepers, and ballast) arose through the necessity of differentiating between the temporary contractor's line and the road as finished for permanent use. The introduction of the name was one of many interesting points regarding track terminology that were dealt with on Tuesday by Mr. Charles E. Lee in an address to the Brighton section of the Permanent Way Institution. His earliest reference to such differentiation was the first (1825) edition of Thomas Tredgold's "Practical Treatise on Railroads and Carriages" which contrasted the forming of "temporary ways" with the fixing of "permanent roads." The oldest use of the precise term permanent

way which Mr. Lee had so far been able to trace was in the report of the London & Birmingham Railway dated February 3, 1837, which referred to the additional cost arising from the increased prices it had " been found necessary to give for all the materials composing the permanent way, such as Rails, Blocks, etc. . . ." Exactly a year earlier the report had spoken of " the Rails, Chairs, Stone Blocks, and Wooden Sleepers, required for the permanent Railway. . . ." In a report which Charles Vignoles made on November 25, 1836, to the directors of the Midland Counties Railway he consistently used the term " upper works of railways," as did Francis Wishaw in his " Analysis of Railways " in 1837. The latter, however, gave the definition in his " Railways of Great Britain and Ireland " (1840) that " the rails, chairs, pins, keys, felt-blocks, sleepers, and ballasting, constitute the permanent way, or upper works of railways."

* * * *

Gold Coast Railway

Higher prices for cocoa and continued activity in the gold mining industry resulted in improved trade conditions so that the gross revenue of the Gold Coast Railway for the year ended March 31, 1937, increased by £113,267 or 11·32 per cent. Ordinary expenditure (£454,485) increased by only £30,219 or 0·71 per cent., and a contribution of £139,491, against £124,375, was made to renewals fund. Net earnings returned 5·56 per cent. on the total capital expenditure of £9,354,139. Cocoa accounted for 39·87 per cent. of the total goods revenue of £856,896, which showed an increase of £77,776 or 9·98 per cent. The tonnage is the highest yet achieved. In the passenger revenue of £201,137 there was an improvement of £27,203 or 15·64 per cent.

	1936–37	1935–36
Passengers	3,537,050	3,101,425
Goods, tons	955,888	912,299
Paying train-miles	1,197,969	1,148,786
Operating ratio, excluding renewals	40·81 per cent.	42·41 per cent.
	£	£
Gross earnings	1,113,603	1,000,336
Expenditure (including renewals)	593,976	548,641
Net earnings	519,627	451,695
Loan charges and sinking fund	403,994	415,712
Surplus	115,633	35,983

On the Takoradi—Kumasi main line of 173 miles the track is 80 lb. throughout, and 38 miles (Accra—Mangoase) of the Accra—Kumasi main line of 193 miles are being relaid with 60 lb. (formerly 45 lb.) rail.

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The Post Office (London) Railway

One of the many striking facts which emerge from a perusal of the latest G.P.O. " Green Paper " (No. 36—" The Post Office Railway ") is that of the continuous progress which is being made in the development of the 6½ miles of Post Office (London) Railway. This 2-ft. gauge tube line, which was described and illustrated in our issue of February 10, 1928, was begun just before the war and the main-line tunnelling contract was completed during the period of hostilities. The empty shell served to house valuable objects of art from various London museums. Not until post-war prices had fallen was the electrical equipment taken in hand, and it was only ten years ago that the work was completed. Staff training on half the line began in May, 1927, and the whole line was opened for traffic in the following December. One of the greatest early difficulties was rapid rail wear, which so increased that in 1931 some 17,000 yd. of rail were changed or turned. Steps taken to overcome the trouble have been the use of harder rails, the fitting of automatic lubrication on sharp curves, and the alteration of the car design. The success of these efforts is indicated by the fact that in 1936 only 3,120 yd. of rail were changed. Major W. G. Carter, Assistant Controller, London Postal Region, is the author of this Green Paper, and he tells his fascinating story of the Post Office Railway in an accurate and entertaining way that should appeal alike to the engineer and to the man in the street.

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An Operating Failure and a Careless Driver

A summary of Lt.-Col. A. H. L. Mount's report on the accident on the Southern Railway at Swanley on June 27 appears on page 656. This was a case where a signalman infringed a special instruction, his action coinciding with the very failure on a driver's part against which it was prudently issued to provide. The train was being specially stopped at Swanley, and there was a distant signal against it at adequate braking distance from its home signal as the plan accompanying our summary shows. The driver, whose evidence at the enquiry did him no credit, said he missed this distant signal, although he seems to have seen the arm above it, and did not hear his fireman's warning shout. He was, in any case, travelling at about twice the permitted speed for the place and, over-running the home signal, crashed into some vehicles in a siding and did considerable damage. Four lives were lost. Col. Mount sees no reason to alter the signalling, inspected, after some changes, in 1935, but he directs attention to the general working at the station, particularly in connection with any arrangements necessitated by trains being out of course. A passenger, who was imprisoned in the wreckage for nearly an hour, complained that tools were inadequate. Col. Mount thinks that there was some shortage at first and recommends that the equipment distributed at stations and carried by trains be reviewed. He also points out the desirability of being able to initiate priority telephone calls for certain purposes; there was difficulty in speaking to the traffic controller and apparently unnecessary delay in requisitioning breakdown trains, owing to circuits being so much engaged.

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An Accident at Swanley 37 Years Ago

On November 23, 1900, a passenger train from Sevenoaks, drawn by 2 engines, overran the same signal at Swanley Junction and was derailed at the siding dead end, but no passenger was hurt. The train had the Westinghouse brake, the standard on the London, Chatham & Dover, and after the accident it was discovered that the leading engine had a screw-plug inserted in an exhaust passage of the driver's equalising brake valve. The engine was one of a number recently obtained from contractors, and all were found to have such plugs in the valves, rendering them inoperative until the handles were moved to the emergency position. The leading driver acted without much common sense, not realising that the defect existed until it was too late, when he made a violent brake application causing the carriage wheels to lock, largely neutralising its effect. He attempted to reduce speed at the Yard box distant, then controlled from the Junction box, but, for the above reasons, unavailingly, and ran some 700 yds. farther before awakening to the seriousness of the situation. The inspecting officer placed the primary responsibility on the driver, but did not fail to pass strong and well merited censure on those who had inspected and accepted the locomotives with such a serious defect in their brake equipment, particularly the chief brake inspector, who was responsible for instructing the enginemen how to use the Westinghouse apparatus.

The Frontier Shack

Among the many novel features of the City of Denver streamlined train is a carriage called the Frontier Shack, which is a reproduction of a western shack typical of the period between the close of the Civil War and the early 'nineties. Every effort has been made to recapture the intriguing atmosphere (mental, if not physical), of rough hospitality that was characteristic of the outlying hostelries which were landmarks in the pioneer days of the Overland Route. There are two such cars, named respectively the General Grant and the Buffalo Bill, each finished internally in rough style, the walls and ceilings being of unmatched white pine boards, and the flooring of old-fashioned scrub oak, all face nailed and of uneven lengths and widths. Rough board tables for four are hinged to the walls on each side, and long square iron spikes for coats and hats protrude from the walls. The hanging lamps, though lit by electricity, are reproductions of the old kerosene variety. The walls are decorated with horns, rifles, and other impedimenta of pioneering days, as well as old portraits of national heroes, actresses, athletes, and other characters of interest to the erstwhile frontiersman. After a drink or two in this travelling museum—for, of course, a bar is the *raison d'être* of the shack—passengers return to the reclining seats and soft blue lights in the other parts of one of the latest crack trains in the U.S.A.

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Arctic Railway Activity

Shortage of raw material for iron and steel manufacture, due to the stoppage of supply from the north of Spain, coupled with the exceptional demand, has had a remarkable effect on the fortunes of the electrified Lapland iron-ore railway which serves the Swedish mines in the Kiruna and Gällivare area, well within the Arctic Circle. Throughout the year the neighbouring Norwegian port of Narvik, owing to the beneficent influence of the Gulf Stream, remains free of ice, and the 32 miles of line which connect it with the Swedish State line at Riksgransen form probably the most profitable stretch of railway in Norway. To the end of August this year 5,015,088 *tonnes* of iron ore, in 142,349 carloads, had been carried down to Narvik, and in that month twenty ore trains, each made up of some 45 six-wheel roller-bearing wagons of 35 *tonnes* capacity, were being worked over the line daily; the total of 30,000 *tonnes* a day was sufficient freight for four large ore-carrying vessels. Powerful electric locomotives handle this traffic over the heavy grades of the railway. There is similar activity between the mines at Gällivare and Luleå, on the Gulf of Bothnia, though owing to freezing of the gulf in wintertime, this is confined to the summer months. The entire Lapland system handled 1,231,000 tons of ore during the month of August alone.

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An Interesting Call-on Signal Control

On page 642 appears a short article giving particulars of the important power signalling installation brought into full service early last year at the Gare du Nord, Paris. An interesting feature of this work is the special control adopted for the call-on indication on the home signals for the platform lines. As at several terminal stations in this country, it is customary to stable parts of trains at the buffer stops on certain lines during slack periods, making it necessary to admit running movements under a cautionary signal of some sort, the call-on aspect—lunar white light—being used in this instance. There is a risk that if a train were, say, wrongly described it might be admitted to such a line and be too long for the free space available, leaving the rear overlapping points and crossings in the yard, which might block other movements and prove very inconvenient. The call-on indication has therefore been controlled by the approach and platform track circuits in such a manner that not only must the incoming train be brought nearly to a stand before it can be shown, but the route must also be set for a platform line having enough clear space to receive it. If the train is too long for the space available the call-on indication remains locked.

* * * *

Failure of Axles

A few years ago, the New South Wales Government Railways experienced trouble from cracking of certain axles used on the electric rolling stock of the Sydney suburban passenger service, and considerable investigation was made into the causes. The subject is treated in a paper by Mr. G. W. Hirst, B.Sc., published in the Journal of the Institution of Engineers, Australia. Several axles were condemned because of the development of cracks in the wheel seats. This type of trouble has also been experienced in Germany and in the United States of America, and is probably well known in other countries. Until the cracked axles occurred in the electric rolling stock of the New South Wales Government Railways, condemning of axles for this cause was rare. There had been cases in the past, but these were looked upon as exceptional. An inspection was made of axles put into service as far back as 1887, and they showed the same characteristics as the axles of the electric rolling stock. On the journal end of the wheel seat, oil and grit had produced a similar abraded appearance of the surface up to the line of contact of the wheel seat and hub, whilst at the other end of the wheel seat, the line of contact had progressed as usual within the hub, but in the absence of oil, rust had formed in the crevice. No cracks were, however, detected. In the absence of apparatus for reliable photo-elastic measurements, a mathematical investigation based on the theory of elasticity had to be undertaken, and this showed that there was a tensile stress induced in the wheel seat which was approximately half of the radial pressure, the practical effect of which was to produce the permissible range of stress.

* * * *

Taming the Passenger

The railway booking office, a familiar institution to all of us, is today rapidly undergoing a transformation, the credit for the initiation of which rests in this country mainly with the L.N.E.R. and London Transport. The appearance of the passimeter booking office and of the ultra modern glass fronted type to be found at such places as Harrogate, York, and Newcastle, has at last brought fully into the public gaze that most retiring of all individuals, the booking clerk. Whether such dazzling publicity after nearly a century of cloistral semi-seclusion gives him a feeling of self-consciousness we cannot say, but it is certain that he can no longer play Thisbe to our Pyramus as we mutter hoarsely through a chink in the Wall. In future no longer stooping servilely, as in the older stations of certain railways, shall we meekly beg the boon of a ticket while squinting at a stomach of imperious and generous proportions, an imposing feature which, especially when draped with a massive gold albert watch chain, could be depended upon to uphold the dignity of the railway company by quelling on its very threshold the most cantankerous or the most frivolous of passengers. Deprived of the full power of this mesmeric member, the booking clerk must seek to retain his authority by cultivating the magnetic eye of a Dictator, unless of course the new state of affairs has been deliberately brought about as an experiment in psychology on the passenger and the railway servant.

British Engineers Abroad

ONE of the less prominent features of the new conditions in world economy is the increasing evidence of a self-sufficiency in overseas countries in technical education and therefore in the number of technicians locally available. When railways, for example (to quote one branch alone of engineering science), were being constructed in the Colonies, in the East, and in South America, by British companies and contractors, the technical staffs were invariably British, and the field for British-trained engineers was world-wide. A career was assured to the young engineer graduating in our universities or technical schools, and especially to those enrolled in one of the corresponding institutes. Now, however, the closing of frontiers to immigration, the spread of education abroad, both general and technical, and the claims for protection of each country's nationals, means that the field for our engineers is diminishing year by year. The recent report by the Wedgwood Committee on the Indian railways is a case in point, where it refers to the Indianisation of the railway staff in that country; and nearer home there are the European countries where foreign technicians are admitted and tolerated only in very exceptional circumstances, and naturalisation, or at least the acquisition by the foreigner of local degrees or diplomas, is enacted.

There is no doubt still a very considerable field open to the British engineer, but not in the conditions that prevailed when the British were responsible for the construction of railways all over the world. What openings there are now are for men of highly specialised training and experience, engaged for specific works, and for relatively short periods. Not only therefore is the field narrowed, but there is the added difficulty for the engineer returning from abroad after completing an engagement, of finding a fresh job. Indeed, it is said that for work in England some employers prefer men who have not been abroad. In these conditions really good men are chary of taking service overseas and thereby risking their future. Can we readjust ourselves to these new conditions? This is the question that is being asked by the governing bodies of the institutes representing the different branches of engineering. The Old Centralians, or old students of the City and Guilds Engineering College, have been considering the formation of an Overseas Engineers' Association, which is intended to serve as a centre for maintaining contact between engineers abroad and their interest in the home country; and if, as is hoped, the scheme meets with sufficient support, it may form the basis of an effective organisation for the desired end.

It has been suggested that as regards sending out technicians to the Colonies and Dominions, and to India, a national service might be instituted on the lines of the Army Engineer Corps, engineers being interchangeable for promotion, &c. It is difficult otherwise to visualise any organisation which could guarantee re-employment to the engineer returning from overseas. And yet without this prospect of re-employment, and with the ever narrowing field for ambition, there is little inducement for the young man to seek a career abroad. On the other hand, if British engineers do not go abroad there is the danger that those of other nationalities will seize the neglected opportunities, and although the reliable engineer conscientiously uses or recommends the best material, irrespective of the country of origin, he is naturally predisposed in favour of the equipment he knows best, which is generally that of his own country. Our trade therefore largely depends on the work of our engineers overseas, and it is in the national interest that where it is still possible for British technicians to contract their services abroad they should be backed by their institutes or by the proposed association, and guaranteed some sort of support on returning home. Unfortunately, the whole problem is really only another manifestation of the struggle on the part of every nation to dispose of its surplus production, human and otherwise, and it is hardly to be hoped that there can be any improvement possible within the structure of a system of economy that drives every nation into this impasse.

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Road Transport of Fish

A DECISION of some interest was given recently by Mr. Henry Riches, the licensing authority for the Northern Scotland area, in what has become known as the "Aberdeen fish case." The matter arose from applications made by Mr. Charles Alexander, haulage contractor, of Aberdeen, for additional transport facilities, and the case involved sittings on 21 days spread over a lengthy period. The facts are that the applicant began business with one lorry in March, 1926, and his present application was for additional licences to be granted him for the carriage of fish or other goods to Liverpool, Birmingham, Manchester and London, as well as for a licence for a daily carrier service to Banff. The licensing authority, in his judgment, pointed out that since 1926 the applicant had acquired seven other small haulage businesses and was allowed licences to operate the vehicles on the terms of the licences held by the original owners. There had, however, been a material change in the circumstances of the acquired businesses since the grant of the licences to the original owners. If there was an intention to change the nature of a business the fact should be disclosed to the licensing authority, but no such change was disclosed in any of the seven applications. Accordingly it was necessary for the applicant to prove need in support of each application.

The railway companies, who opposed the grant of the additional licences, had shown that they had lost traffic and that they carried fish in specially constructed vans to the four places named; that they ran trains daily from Mondays to Fridays inclusive in order that the fish might reach the places named in time for the opening of the wholesale markets, while the applicant admitted that he could not provide facilities on those days by road equal to those afforded by the railways. So far as the question of rates was concerned, the authority stated that although the road rates were below the level of the rail rates, it had never been suggested during the proceedings that the applicant was carrying fish or granite at unremunerative figures; on the contrary it appeared from the particulars disclosed that the rates charged were remunerative. On this aspect of the matter Mr. Riches intimated that he did not consider it his duty to have regard to a difference between road and rail rates, as the Appeal Tribunal had held that the legislature did not intend that questions relating to rates should be taken into consideration when deciding whether or not an objector had proved that suitable transport facilities exist. He therefore advised any traders who might feel aggrieved at the railway rates in question to seek their remedy by applying to the Rates Tribunal under the provisions of the Railways Act, 1921.

After reviewing all the circumstances, in conjunction with the decisions of the Appeal Tribunal, Mr. Riches had come to the conclusion that the services of the L.M.S. and L.N.E. Railways were adequate for the conveyance of fish from Aberdeen to the places named: that, with the possible exception of the Banff application, there had been a material change in the circumstances of all these businesses, and that the applicant had failed to prove need. Accordingly, he decided to grant licences to the

applicant to operate seven vehicles of 27 tons unladen weight and a 2-ton trailer to Manchester, but refused permission for the operation of a further sixteen vehicles of 50 tons unladen weight belonging to the businesses bought by the applicant since he obtained his original licence. So far as the carrier's service to Banff was concerned, his counsel was unable to give a pledge that the vehicles would not be used for the conveyance of fish to England, and the licence for these two vehicles was therefore refused.

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Kowloon-Canton Railway (British Section) in 1936

IN spite of the fact that $245,000 were lost to this railway from sources beyond the control of the administration, the balance on the operating account was only $7,382 below the budget estimate, and the operating ratio improved from 64·53 to 63·49 per cent. in 1936. The unforeseen losses are estimated to have been (1) on foreign haulage, where receipts fell by $157,158 due to the handing over of the three "C" class locomotives to the Chinese section for working the express services on May 1, and (2) on account of the closing down of the Shum Chun casino on September 1, causing a loss of $88,000 on the last four months of the year. The following are the principal comparative figures for 1935 and 1936:—

	1936	1935
	$	$
Gross receipts	1,245,469	1,411,675
Operating expenses	790,736	911,020
Net receipts	454,733	500,655

The operating costs were the lowest since 1929, and compared favourably with the budget figure estimated, namely $860,885. Altogether the year's results may be considered as very satisfactory and much credit is due to the administration and staff generally.

Although river steamer "pirate" services continued to compete with the railway, an agreement was reached on February 7 with the more responsible steamboat companies by which the second and third class fares were stabilised at reasonable levels for a trial period of three months. Also on August 21, a re-adjustment in the competitive relationship between river and rail transport was effected, by which the larger steamers cancelled their day sailings and concentrated upon night services, thus ceasing to duplicate the normal functions of the railway. These measures of co-ordination have benefited both parties, and led to substantial increases in revenue; the ratio between rail and water carryings appears to have settled down to a steady constant figure during the latter part of the year.

Two Hall-Scott railcars, which were not proving profitable, were converted during the year into the *Taipo Belle* streamlined, luxury parlour observation railcar—described and illustrated in our Diesel Railway Traction Supplement dated May 14 last—and a sister car. It will be remembered that this type of car can be run attached to the rear of an express train as a slip coach, or used as an independent unit according to the dictates of traffic. Among the traffic features of the year were a rise of 10·48 per cent. in the number of passengers conveyed between Kowloon and Canton, and a new passenger traffic density high water mark of 2,366,567 passenger-miles per mile of line, attained with a saving in train-mileage of 7·82 per cent. Due to a fall in coal prices, running costs per steam train-mile fell from 65·6 to 58·8 cents, or by 13·4 per cent. As a result of the relinquishment of through express haulage on May 1, and of increased weight of through trains, coal consumption rose from 72·47 to 82·21 lb. per train-mile. Interesting details during the year were: (*a*) the equipment of Yaumati station with double-wire signalling and non-trailable point mechanism, the saving of staff wages thus effected being equivalent to a return of 13 per cent. on the outlay incurred; and (*b*) the fitting of the motion parts of all engines with grease lubrication which was completed. The only accidents that occurred during 1936 were 3 minor collisions, 1 engine failure, 11 trespassers killed by trains, and 11 trespassers injured by trains.

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Steam Suburban Services in India

IN a paper entitled "Some Notes on the Mechanical Aspect of Working Steam Operated Suburban Services"—read before the Institution of Locomotive Engineers, by Mr. D. MacAulay, on June 26, 1936, at Calcutta—the locomotive work in the Calcutta suburban area of the Eastern Bengal Railway is described. The local train services in that area have the two usual peak periods daily, between 8 and 11 a.m. and between 4.30 and 7 p.m., with their attendant difficulties in the endeavour to avoid heavy layovers of power. It was found, however, that by a thorough revision of the timetable in 1933, the 47 suburban locomotives in use could work a monthly train mileage 66,240 (or 58 per cent.) higher than was then operated, with a 54 per cent. increase in engine-mileage. An intensified and accelerated service was accordingly introduced in 1934, providing 43 per cent. more trains daily. The 47 locomotives are of 0-6-0 tender or of 2-6-2 or 2-6-4 tank types. The standard speeds of the E.B.R. suburban services on the main line are very creditable, and over the longer distances compare favourably with the G.I.P.R. Bombay electric as may be seen from the following table, and with many British suburban services:—

	G.I.P. (electric)	E.B.R. (steam)	G.I.P. (electric)	E.B.R. (steam)
Distance	20½	21¾	33	33½
No. of intermediate stops ..	15	10	10	15*
Time	53	51	78	82*

* Includes one five-minute stop for water.

Comparing the figures in the last column (with four min. deducted for watering) with the Brighton electrics in similar conditions, the former is within six min. of the latter.

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Private Rail Transport in Germany

THE German authorities have recently re-organised the methods of supervising and controlling the privately-owned railways and tramways—included under the general term *Schienenbahnen* (rail transport), by which is understood any system of transport having a fixed track, so that funicular cableways are included. There are 121 privately-owned railways in Germany, according to an article by Herr G. Galle, of the German Ministry of Transport, in *Die Verkehrstechnik*, with a total route mileage of 4,500 km. (2,796 miles); the length of individual concerns is often very small. The latest complete statistics appear to be those for 1935, when the lines owned 877 locomotives, 195 railcars, 2,176 passenger, and 11,931 goods vehicles. In that year they carried 40,479,467 tonnes of freight and 53 million passengers, and employed 17,185 persons. In 1935, 35 per cent. of the passenger traffic was conveyed in railcars, in the development of which the private lines have done excellent work. Even leaving out lines like the Lübeck-Büchen Railway which approach Reichsbahn standards,

the private lines can now show 1,600 km. of route (say 1,000 miles) with speeds of 50 k.m.p.h. (31 m.p.h.) and over. In many cases improved permanent way and signalling have been adopted to allow of faster running.

Owing to the scattered nature of some of the systems, and the fact that the same concerns owned or had an interest in lines in different places, the relations with the controlling authorities have been somewhat complicated. In order to simplify the position and obtain as much direct personal responsibility as possible, it has been decided to nominate a certain number of officials, corresponding to the position obtaining in the Reichsbahn organisation, who are to be recognised in law as answerable for the undertaking complying with all requirements touching safe and efficient working and responsibility to the public. Where sections of line belonging to a concern are scattered, there may be subordinate officials, answerable to those just mentioned. The Reichsbahn is now an integral part of the Ministry of Transport, and the supervision of the private lines has therefore been placed in the hands of the various divisional managements, or *direktionen*, being generally exercised by the chiefs of the operating sections. Opportunity has also been taken to introduce more uniform regulations and assist the light railway systems in improving their equipment. A special modified signal and operating rule book has been adopted. These measures will simplify the future transfer of any private lines to the State.

* * * *

More Long Rails on the Delaware & Hudson

THE entire 1937 re-railing programme of the Delaware & Hudson Railroad is being carried out on the principle that rail joints should exist only where necessitated by track circuits and points and crossings. In THE RAILWAY GAZETTE of March 6, 1936, we recorded this decision and described the initial experimental lengths of welded track upon the experience of which it had been based. Until 1937 Thermit welding was used, with the exception of one length of track in which flash butt welding had been used. So satisfactory was the latter that a portable flash welding plant has now been developed by Sperry Rail Service, with which the Delaware & Hudson has entered into a contract for the larger part of the present programme of rail welding. All the flash butt welding carried out under this contract includes subsequent heat treatment of the welds for relieving any abnormal stresses set up as a result of the welding. Our American contemporary the *Railway Age* for September 4 described the welding plant. It comprises a welding car containing the welding machine, a generator car housing two turbo-generators for supplying current, a steam locomotive to supply steam to the turbines, a rail-rack car for lining up and otherwise preparing the rails for movement to the welding machine, a series of five flat cars on which the stress-relieving equipment and joint grinders are mounted, and the requisite number of flat cars for subsequent transport of the long rails to the site of re-railing.

While each weld is being made, the final operations are carried out on the welds already completed. These operations, which proceed on five joints at a time, complete the rail for service in the track. The first operation is the heat treatment for stress-relieving through the weld area, and the others involve the grinding away of the upset metal produced in the process of welding. As the strings of rails are extended by each new length they are pulled forward through the welding machine on to the storage cars by means of a cable and an electrically-operated winch on a flat car at the far end of the storage cars. As many as 12 of the long rails have been lined up on cars and taken out to the line without any difficulty. The Sperry company provides six men for the work in addition to from 10 to 12 men provided by the railway company, and production is from 100 to 166 joints per working day of two eight-hour shifts.

After the welded lengths of rail have been unloaded at the site, new soleplates with either M. & L. or compression-type spring clips are fitted. The rails are subsequently slewed into position in the track and temporarily joined together with standard four-hole fishplates using only two bolts. Later these joints are Thermit-welded to form continous rails up to a mile or more in length between insulated joints. Ultimately it is proposed to make the welds between the long sections of rail before slewing the rails into the track, for each weld takes about three hours to make, and thus the interruption to traffic can be less. The long rails are unloaded from the flat cars by pulling them off from the rear of the train and laying down on the sleeper ends ready for the application of the new soleplates and for slewing into final position. All the rail welding on the Delaware & Hudson has been carried out under the immediate direction of Mr. H. S. Clarke, Engineer, Maintenance of Way.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Queen Victoria's Honeymoon Journey

London, N.W.11.
October 13

TO THE EDITOR OF THE RAILWAY GAZETTE

Sir,—I have just come away from seeing the film "Victoria the Great," now being shown in London, and I find myself not a little amazed at the trouble and expense to which a producer will go in order to create a scene historically totally incorrect. According to this in many other respects admirable film, Victoria and Albert travelled to Windsor for their honeymoon by the G.W.R. in a narrow-gauge train drawn by the old Liverpool & Manchester locomotive, *Lion*! In actual fact, of course, the royal couple travelled by road, the Queen's first experience of railway travel not being until June 13, 1842, some two years later. As all the recognised accounts, such as are to be found in the Annual Register for 1840 or Sir Sydney Lee's biography of the Queen, are correct in their description of these incidents in the Queen's life, one cannot help feeling that this is a piece of deliberate and regrettable telescoping of history, introduced to enable the producer to get more into his film.

Yours faithfully,
JOHN ANTHONY

FOREIGN VISITORS.—The Travel and Industrial Development Association states that the increase in the number of visitors from abroad to this country, which has been notable throughout the year, was again in evidence during August. The return issued by the Home Office shows that the August total of holiday visitors was 46,641, an increase of 1,096 over the August figure for last year. The combined total of holiday and business visitors was 53,923, an increase of 1,452. Visitors from the United States (18,518) increased by 2,747. The figures for the first eight months of the year are considerably in excess of those for the corresponding period of last year and constitute a record. To the end of August the number of holiday visitors from other countries totalled 231,727, compared with 209,056 for the same period of last year. Weekend and day visitors from France and Belgium are not included in these figures, nor are the numerous overseas-British visitors who travel with British passports.

PUBLICATIONS RECEIVED

Northern Ireland Rail and Road Timetables.—The various authorities concerned with the provision of rail and road transport in Northern Ireland have introduced, with the winter timetable, an excellent combined booklet showing all the passenger facilities in the area. This booklet, which is issued gratuitously, has a page size of 6½ in. by 4¾ in. and is therefore well within the capacity of the average pocket. Within its 304 pages it includes all the rail services operated by the Belfast & County Down and L.M.S.R. (Northern Counties Committee) Railways, and also the Northern Ireland section of the Great Northern Railway. Following these are the road services operated by the Northern Ireland Road Transport Board, and then a section devoted to combined rail and bus services. At the end is a folding diagrammatic map indicating railways and their owners by means of three different forms of black line; regular bus services with a full red line; and summer bus routes with a broken red line. In addition to the actual time-tables a large amount of information is included regarding cheap passenger fares, luggage in advance, and interavailability of rail and road tickets. The whole production is neat and handy, and should prove a welcome contribution towards the easier use of the co-ordinated road and rail services in Northern Ireland.

Proceedings of the Twelfth International Congress of Acetylene, Oxy-Acetylene Welding and Allied Industries, London, 1936. London: The British Acetylene Association, 64, Victoria Street, S.W.1. 1,566 pp., in 6 vol., each 11¾ in. × 8¼ in. Illustrated. No price stated.—This congress, organised by the British Acetylene Association, was held at Caxton Hall, Westminster, London, S.W.1, from June 8–13, 1936. The present six volumes provide a permanent and agreeable souvenir of a congress which, apart from its very apparent success, was notable in three other respects: it was the first of such congresses to be held under Royal patronage, and it marked the centenary of the discovery of acetylene as a gas by Davy in 1836. It marked also the fiftieth anniversary of the first commercial production of acetylene in England. The scope of the subjects covered embraces everything from the more usual analysis of the mechanical properties of welds and weld metal, to the academical discussion of psychological tests for the selection of trainee welders, and the æsthetic aspect of gas welding and cutting in the arts and handicrafts.

The subject matter is excellently presented. Seventy-four papers (28 of which were read and discussed in congress) are reprinted, each in its language of origin and in English, with a final summary in English, French, and German. The illustrations are reproduced in duplicate, with their captions suitably transcribed in the English version. The value of such a collection to students and others will be self-evident. The congress was attended by nearly 800 delegates, from 25 countries. For those whose appetite for tri-lingual discussion was easily sated, an excellent programme of 26 technical films was shown throughout the week.

London Transport Today.—Early last year the London Passenger Transport Board began to issue in the London daily newspapers a series of novel advertisements with the object of explaining the intentions of the board, and the methods by which it seeks to achieve its objects. The first advertisement appeared in February, 1936, and the last in April, 1937, and the entire series has now been reprinted in booklet form with a foreword by Lord Ashfield, explaining that the series met with such a kindly reception, and was so widely commented upon, that re-publication in brochure form was adopted. The text matter of the actual advertisements (which appeared in two series) is further amplified by a map of the board's areas indicating also the limits of such other administrative areas and districts as the County of London, and the Metropolitan Police District.

Winter Resorts.—Great Western Railway, Paddington station, W.2. Autumn, "season of mists and mellow fruitfulness" is now quickly merging into winter which, so far as the big centres of population are concerned, is a "season of rain and clammy fogs." Those fortunate enough to be able to think of migrating to other lands for this period, would do well when doing so to lend an ear to some of the convincing arguments put forward by Mr. Maxwell Frazer in this book for spending winter in the West of England. The beauty, charm, and wide variety of attractions of this part of the country are known and appreciated by thousands of summer tourists. The advantages which an equable climate bestows on it as a winter playground are not so widely appreciated, and it is to assist in the diffusion of this knowledge that this illustrated book has been produced.

Oil Extractors and Air Filters.—Two illustrated leaflets from Harry Lancaster & Co. Ltd., 24-25, Great Tower Street, London, E.C.3, describe respectively types of oil extractors and air filters. The Ecliptic extractor is intended for attachment to pipe lines conveying compressed air, gas, or steam, from which it will eliminate all condensed moisture, oil, and other harmful impurities. There are no moving or absorbent parts to be cleaned, the only attention necessary being the periodical emptying of the extracted matter chamber by means of the drain cock provided. Another pattern of Ecliptic extractor is combined with a cooler for reducing the temperature of the air or gas before delivery to the apparatus to be driven. Cooling is by air or water flow as desired. The Ecliptic air filters described in the other leaflet are supplied with or without a silencer. The filtering medium is noteworthy for its long life and the ease with which it can be cleaned.

Lifting Jacks.—A new illustrated folder from the Consolidated Pneumatic Tool Co. Ltd., of Egyptian House, Piccadilly, W.1, sets out a selection from the range of Duff-Norton and Genuine Barrett lifting jacks. The jacks have been grouped according to their uses. For instance, the range of automatic lowering jacks is for general engineering work, the high tonnage ball bearing jacks are for heavy engineering, track jacks for repairing and relaying railway track, and the 1-ton to 5-ton jacks for road motor vehicles. Attention is drawn to the cable reel jacks which have been designed to meet in particular the requirements of telephone and cable companies. Particulars are also given of the Duff & Norton traversing bases for jacks and the Duff extensible trench braces.

Portable Electric Drills and Blowers.—We have received from the General Electric Co. Ltd., Magnet House, Kingsway, London, W.C.2, the new edition of the catalogue of portable electric drills and blowers. Full descriptions and prices of a very wide range of these appliances are given, together with details of spare parts, and illustrations of typical applications. Three principal types of drill are manufactured, namely, the pistol type, the breast type, and the screw-feed type. The blowers are powerful light-weight machines ideal for blowing dust from electrical machinery, store bins, and other inaccessible places, sawdust from woodworking machinery, &c. Alternatively they can be used with suction accessories as hand-operated suction cleaners. Two sizes are available having nozzle velocities of 159 and 216 m.p.h. respectively.

Steel for Steam Turbines and Steam Fittings.—We have received from Hadfields Limited, of East Hecla and Hecla Works, Sheffield, an illustrated catalogue of Hecla/A.T.V. non-corroding and heat-resisting steel, suitable for steam fittings and steam turbines. This steel, it is claimed, by its maintenance of remarkable strength at high temperatures, can be used successfully with the highest steam temperatures now actually employed or even visualised. The blading in Hecla/A.T.V. steel of one experimental steam turbine installation has sustained successfully a working temperature of 1000° F. for many thousands of hours. Hecla/A.T.V. steel is an austenitic alloy steel with, it is maintained, complete physical and chemical stability at all temperatures. Details of the mechanical properties of the steel are given, together with working instructions and the forms in which it is available.

THE SCRAP HEAP

SPAIN 60 YEARS AGO

Looking through the files of *The Railway News* the other day we came across a brief note in the issue of September 9, 1878, to the effect that the railway companies in Spain "have been informed that an armed guard will be provided by the authorities to accompany passenger trains whenever it may be applied for."

* * *

A circus was carried from Cork to Cardiff last week-end. One of the Cork to Liverpool steamers was diverted to land the circus at Fishguard Harbour on Sunday. Special arrangements were made by the Great Western Railway for unloading the animals, which included three elephants, each 9 ft. in height and weighing two tons, cages of lions and tigers, other wild animals, and horses and ponies. In addition there were many tons of baggage and props, and 43 circus artistes. As soon as the Circus had been landed on the quay it was loaded in a special train, some of the vehicles of which had been specially strengthened to carry the elephants.

* * *

BRAVERY

Porters, guards, and all the officials who could be mustered, were engaged in collecting water in buckets, as it spouted from many leaks in the engine's tank, and throwing it on to the side of the engine boiler, which was almost red hot. It was feared that the boiler might explode.—*From "The Times."*

If only someone had told them that a red-hot boiler never explodes!

* * *

TABBY OF PADDINGTON

Paddington has a famous tabby cat. His name is *Jim* and he is well known to passengers and staff alike. *Jim* has his home in the restaurant-car department but considers it his duty to make a daily tour of the station. He may be seen strolling along No. 1 platform, in the booking office, refreshment rooms, head office corridors, subways, or watching the taxis arrive. *Jim* is normally an orderly cat—but after office hours he has a vice. He prefers beer as a night-cap to milk, tea, or any other beverage and with due regard to licensing hours contrives to be on his last lap as "time" is called.

But *Jim* is not the only cat at Paddington. There is *Joe* who lives in the linen room of the hotel. He likes to ride on a barrow or hamper of linen and never tires of watching the spinning wheels and bobbing needles of the sewing machines used to carry out repairs. Another cat is *Smokey*, a blue Persian, who lives in the refreshment room girls' hostel. He is the aristocrat of the Paddington cats and prefers to watch the trains far below from the roof high above the lines, although he is not averse from descending in the lift for a stroll along the big parcels platform. The goods shed cats are shy of publicity—they are busy cats, the terrors of rats and mice, and confine their friendship to one member of the staff.

In direct contrast to *Jim* is *Tibby*, the baby son of two cats in the Mint Stables, built on the site of an old public house. *Tibby* is being brought up on the strictest of teetotal lines. Like his parents he refuses even the milk supplied by the company and drinks only water. *Tibby* is growing up to be a great favourite with the 450 horses in the stables. He visits them in the stalls and mangers and greets them when they come in from work for a drink—of water.

* * *

We reproduce below an example of one of the stamps issued by the Iraq Railways Administration in connection with its railway letter service. These stamps are affixed to parcels in addition to the necessary postage stamps; they are issued by the Railway Department and not by the Government.

Parcels bearing such stamps can be forwarded to certain railway stations only, and should not exceed 80 grams in weight. The value of each of these stamps is 10 fils (about 2½d.), and the Railway Department makes no charge on such parcels other than the value of the stamp.

* * *

AN ADDED THRILL

While I was at school I remember keenly a lad who used to dare me to do a certain trick of his. At the bottom of the road there was a railway bridge and an embankment. This was long before the time of the electrification of railroads, and only a fence separated the embankment from the side walk. This boy and I used to sneak down at dusk, climb over the fence and lie in the long grass watching the red signal light, and the moment it flashed green a look of ecstasy used to come into the boy's face. We would wait until we heard the rumble of the train, and saw her lights, and then he would wriggle up through the long grass and over the rails and lie down in the four-foot way and let the train crash over him. He told me the thrill of hearing those noisy old trains go rumbling over was indescribable. One day he said to me, "Why don't you try it?" I crept up there and lay quiet and still and let the train crash over me. I must admit the thrill has never quite left me, and I sometimes get the same sensation when I hear a noisy train rattling by now. But the second time I tried was rather unfortunate, because out of the old ash box of the engine a hot cinder dropped on to the small of my back, and I had to wait until the train was right over me before I could get up and shift it; by that time it had burnt through my coat and clothes and was scorching by back pretty badly. I had some difficulty in explaining how this happened when I got home, but my friend stood by me very well, and somehow or other we managed to get away with the lies we told.—*From "Memories that Remain" by Commander A. B. Campbell, in "The Listener."*

* * *

STORM UNDER LONDON

Mr. J. T. Croxford, the Chief Electrician at the Royal Opera House, Covent Garden, recently paid the following tribute to the efficacy of the London tube "storm making" apparatus. The communication was a letter to the Editor of the *Evening News*:—

"During the last twelve years I have spent (by my reckoning) 15 days waiting for lifts at the bottom of the shaft at Covent Garden tube station. And I have never ceased to wonder at the permanent wind-storm that blows down there—90 feet under London. I have tried for years to produce the same effect on the stage during the Opera Season—but in vain.

"Hundreds of times I have seen opera patrons step from a train with beautifully waved hair—only to reach the lift dishevelled and clutching wildly at stray strands. A Covent Garden porter once told me, with the Garden's traditional humour, that he daren't go to work in his striped trousers—for fear of losing the stripes!"

* * *

Berlin Underground officials were engaged for over two hours on a recent night in chasing a fully-grown roebuck which leapt down the entrance stairs at the Seestrasse station, and galloped along the line towards the centre of the city. The animal appeared towards one o'clock in the morning in the Limburgstrasse, having escaped from the "Roe Mountains" in the People's Park in the north of Berlin. All Underground officials were notified by telephone, and the passage of the buck was reported from one station after another. All drivers of trains were instructed to travel dead slow. When it was thought that the animal was trapped in the tunnel it turned on its tracks and the chase continued for another two hours. At last the buck was discovered crouching under a stationary carriage on an open stretch of land, and it was lassoed and returned to the zoo.—*From "The Daily Telegraph."*

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

INDIA

The Viceroy on Railways

The Viceroy's recent address to the Central Legislatures referred to the valuable recommendations of the Wedgwood Committee, which were now under examination by the Government of India. Having watched with close attention the railway returns during the last year, as the surest barometer of the prosperity of the country, he was glad to say that nothing could be more encouraging than those returns up to the present date. The revised estimates, submitted to the legislature in February for the year ended March 31, 1937, showed a net improvement of over Rs. 5 crores. The Viceroy hoped that figure would be enhanced during the current year, for the approximate earnings for the five months up to the end of August were about Rs. 2·75 crores or over £2 million better than during the same period of the previous year.

His Excellency referred feelingly to the heavy loss of life and the long list of casualties involved in the railway disaster at Bihta in July last. He was glad to think that this shocking accident was wholly exceptional, as revealed by the fact that during the five years ended March, 1936, the average number of persons killed in India per annum in train collisions or derailments was no more than 11. This figure was of great significance, considering that during each year 525 million passengers were carried and 125 million train-miles run.

Intensive Use of the "XP" Pacifics

The two new experimental "XP" class 4-6-2 type locomotives, recently delivered to the Great Indian Peninsula Railway by the Vulcan Foundry Limited, have been fitted with nameplates, and No. 3100 is now named *King George VI*, and No. 3101 *Queen Elizabeth*. These engines were fully described and illustrated in THE RAILWAY GAZETTE of June 25 last; No. 3101 has been on exhibition at Victoria terminus, Bombay. It is understood that these locomotives are destined to work the up and down Punjab mails between Bhusaval and Jhansi, a distance of 426 miles, with an intermediate change of crews at Itarsi. The turn-round time as Jhansi will be only 3 hr., so that each engine will cover over 850 miles in about 24 hr., and a remarkably intensive use of power will be obtained.

Transport and the New Stamps

One of the new issue of King George VI Indian postage stamps, which depicts the various forms of mail transport in this country, illustrates a modern Indian State Railway standard Pacific locomotive at the head of a mail train, as well as His Majesty's head.

Permanent Way Improvement

Before the close of the year, the Eastern Bengal Railway will have completed the relaying of its metre-gauge main line from Parbatipur to Amingaon with heavier rails. The journey between Calcutta and Shillong will then be speeded up and passengers will have a smoother and quicker night journey, especially as the carriage stock also is to be improved. By way of an initial instalment of accelerated service, the new October timetable provides for a saving of about 20 min. in the broad-gauge portion of the Assam mail service, *i.e.*, between Sealdah and Parbatipur.

Engineering Section, Railway Conference Association

[In the Indian letter published in these columns of our issue of August 13, a confusion of ideas appears to have occurred in the paragraph headed "Chief Engineers' Conference: Speed of Railcars." Actually, two separate resolutions were passed, one referring to railcars and the other to level crossings, as given below. We are indebted to the General Secretary of the I.R.C.A. for this authentic information.—ED. *R.G.*]

Copy of Resolution N/192 of the Eighth (July, 1937) Meeting of the Engineering Section.

"Having regard to the purposes for and the circumstances in which railcars are usually employed, and to the experience so far gained in their practical operation, the Engineering Section recommend that, generally speaking, the permissible speed for railcars should be greater than that for ordinary trains and should be decided in accordance with the particular design of railcar, having regard to (*a*) axle load, (*b*) centre of gravity, (*c*) springing, (*d*) wheel base, (*e*) efficiency of brakes, and (*f*) position and direction of rotation of the motor."

Copy of Resolution N/193 of the Eighth (July, 1937) Meeting of the Engineering Section.

"While the Engineering Section have in their possession no definite facts to prove that accidents at level crossings are directly, and to a considerable extent, due to the absence of standard signs, this, in their opinion, in no way reduces the desirability, more particularly having regard to the increasing motor traffic, of providing such signs, the necessity for the erection of which is recognised in most other countries, and reiterate their opinion that statutory provision should be made to fix responsibility on road authorities to provide and maintain such signs."

CEYLON

Measures to Improve the Financial Position of the Government Railway

In the course of the Government Railway report for the year ended September 30, 1936 [summarised in an editorial note on page 382 in our issue of September 3—ED. *R.G.*] continued loss in working is anticipated until a complete system of road transport control and of co-ordination of road and rail services are in force, and the immediate formation of a board of control is therefore urged.

Meanwhile the administration is doing what it can to combat road competition by reducing freights (by quoting special rates), by wider advertising, by granting the free storage of goods in special cases, and by a more generous policy in regard to payment of claims for compensation for goods lost or damaged. Other measures to be taken towards this end are the acceleration of services, improved terminal facilities, and the extension of the use of light train units and railcars, and of collection and delivery services.

Diesel Railcars, Named Locomotives, and Spare Parts

The new diesel-electric railcars for use on the coast line are expected to arrive in the island very shortly, and, as soon as they can be placed in service, a new timetable speeding up all services throughout the railway will be brought into use.

Like the Southern Railway (England) the Government Railway is naming a series of its locomotives after the principal schools in the colony; the first engine was recently named, *Royal College*—the ceremony being performed by the Principal of that College—and afterwards hauled a special train full of college students.

Some 28 per cent. of the 7,000 odd spare parts stocked by the Stores Department are now turned out by the railway workshops; in 1928 the shops produced only 14½ per cent.

Objections to Proposed Closing of Railway

"Without any reference to us whatsoever, they take away our railway!" This complaint was made at the meeting of the Madulkelle Planters' Association by Mr. A. E. Ames with regard to the Transport Commission's proposal for closing down the Kandy-Matale railway line. One of the members suggested that as an association they should definitely object to the railway being cut out. He preferred to send all his goods by rail as he did now.

Mr. K. Green, Manager of the A and E Transport Company, said: "As regards the closing of the Kandy-Matale line, I don't think that will take place, at least, for two years. But as regards recommendations for the closing of other sections, I think they will be put into effect almost immediately. I understand that the Commissioners have reported that the Matale-Kandy line is a non-paying section. Probably the Matale section is non-paying, but as far as Wattegama is concerned, it has the support of 99 per cent. of the estates in the district, and they cannot, therefore, say that it is non-paying. In my opinion it is uneconomically run.

If they will look more into expenditure, they could run it at a profit and a very good profit too."

BRAZIL

The Minor Railways

After a period of financial difficulties and inactivity, the Estrada de Ferro Monte Alto has passed over to the State. With traffic re-established and a promise of general reorganisation, the public served by this line looks forward to a period of greater prosperity and hopes for more efficiency in the transport of passengers and goods.

Receipts and expenses for the Araraquara Railway for the twelve months ended May 31, 1937, were as follow :—

	2nd half-year 1936 Contos	1st half-year 1937 Contos	Total Contos
Receipts ...	11,018	7,426	18,444
Expenditure	5,859	5,081	10,940
Surplus	5,159	2,345	7,504

Total receipts for the Campos do Jordão Railway in 1936 reached the record figure of 885 contos, 38 times more than in 1916 when first opened to traffic, passengers carried numbering 109,367 and goods 14,302 tons. This railway serves the small town of Campos do Jordão, in the State of São Paulo, notable for its excellent climate and specially recommended for the treatment and cure of tuberculosis.

Since the re-opening of São Sebastião do Paraiso station, receipts on the São Paulo & Minas Railway have improved considerably. A total of 386 contos was registered in 1936 against 307 contos in 1935, expenditure being 595 and 546 contos, respectively, for these two years. The loss of 209 contos, compared with 239 in 1935, which, in turn, was only half as much as the loss in 1934, is considered encouraging.

Working on the Ilheos a Conquista Railway during 1936 produced a surplus of 1,088 contos of reis, receipts amounting to 2,878 contos and expenses 1,790.

The Santo Amaro Railway also showed a surplus, receipts being 719 contos and expenses 632.

The Estrada de Ferro Nazareth had a good year with receipts totalling 5,676 contos and expenses 4,043, leaving a balance of 1,633 contos, enabling the railway to undertake various works, which, in other circumstances, would have had to wait for a Government grant.

JUGOSLAVIA

Railway Developments

Between 1918 and 1936 the length of railway open for traffic increased from 6·7 km. to 8·2 km. for every 10,000 inhabitants of the country and from 3·2 km. to 4·2 km. per 100 sq. km. It remained comparatively small owing to the financial situation and to the ruggedness of the country and thinness of the population.

Passenger receipts fell from 663·2 million dinars in 1931 to 472·3 millions in 1935; parcels and luggage receipts showed a corresponding drop from 25·6 to 15·6 millions, but goods receipts, which amounted in 1931 to 1,555·6 millions, and fell to 1,328·6 millions in 1932, rose in 1935 to the total of 1,438 millions: total receipts, which in 1931 amounted to 2,244·4 millions dwindled to 1,925·9 millions in 1935.

A finance Bill passed in 1936 authorised two loans of 500 millions each for the renewal of rolling stock and the construction of new lines; 161·5 km. are under construction of which 48·5 km. are standard gauge.

SIAM

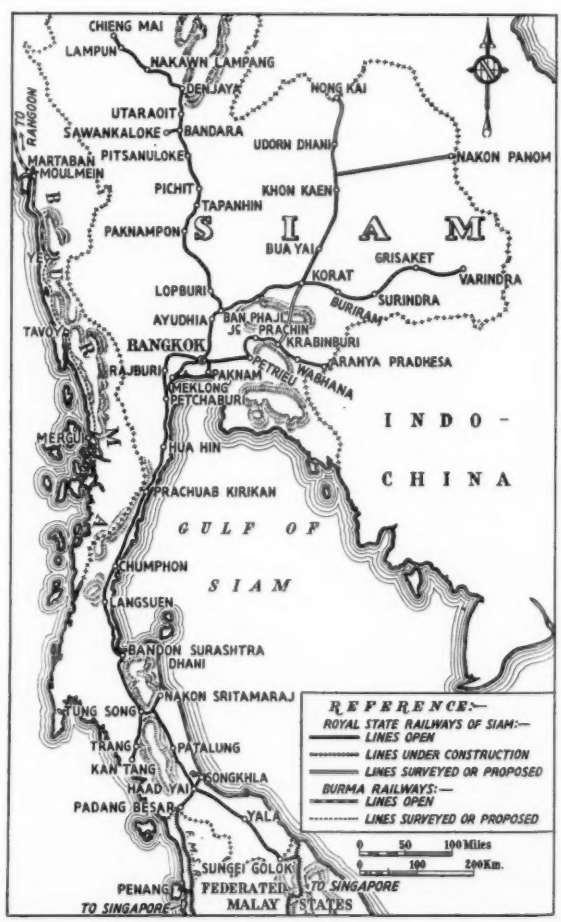
The State Railways System and Principal Services

The present system of the Royal State Railways is as shown in the sketch map below, from which may also be seen the new lines under construction and being surveyed. The total route length is 3,071 km. of single and 28 km. of double metre gauge line. A through express with sleeping and restaurant accommodation runs from Bangkok to Penang and *vice versa* twice weekly, connecting with the mail steamers to and from Europe, and connection is also made with Singapore via Sungei Golok. The Penang expresses are hauled by diesel-electric locomotives described in THE RAILWAY GAZETTE of May 20, 1932; it may be remembered that they were built in Denmark by Frichs. On other services Swiss - built diesel-electric units are used.

New Works in Hand and Proposed

The line northwards from Bangkok is being doubled, 28 km. so far having been completed, but earthwork has been prepared for a further 80 km. An up-to-date marshalling yard has been laid out a few miles from Bangkok at the junction of the northern and southern main lines, and Bangkok terminus and yard are being remodelled. Proposed works include an extension of the workshops and a chord line from Korat to Krabinburi to relieve the existing line via Ban Phaji. The Khon Kaen—Udorn Dhani section is also under construction, and extensions of it to Nong Kai and Nakon Panom, both on the French Indo-Chinese frontier, have been surveyed.

Three hundred wagons and eight 2-8-2 type locomotives have recently been supplied by Japanese firms; two Garratt type locomotives were also on order from Germany on January 1 last, states the Department of Overseas Trade "Report on Economic and Commercial Conditions in Siam."



The Royal State Railways of Siam

CHINA

Railways and the War

One of the few sections of railway in north-eastern China now working normally is the Tientsin-Liaoning line, which is entirely in Japanese hands. Practically all other lines are being used exclusively for troop and war material movements, and many are constantly being bombed or otherwise damaged for military reasons. Even in other parts of China troops are being hurried eastwards by rail, and the Peiping-Suiyuan line north of Peiping is being subjected to bitter attack and counter attack in and near Kalgan and Suiyuan.

BRITISH RAILWAY STATISTICS

"The Railway Gazette" monthly table for June, 1937, as compared with June, 1936, compiled from the Ministry of Transport Statement No. 211

Description	Great Britain*	G.W.R.	L.N.E.R.	L.M.S.R.	S.R.
PASSENGER TRAIN TRAFFIC—					
Number of pass. journeys (ex. season ticket holders) ..	115,868,637	8,350,843	18,081,065	28,242,608	20,204,940
Increase (+) or decrease (−)	+ 4,202,575	+ 66,098	+ 266,015	+ 79,668	+ 852,620
Passenger receipts (excluding season ticket holders) ..	£5,336,823	£690,045	£1,091,510	£1,754,610	£1,187,171
Increase (+) or decrease (−)	+ £188,294	+ £18,460	+ £45,391	− £1,947	+ £97,890
Season ticket receipts	£740,569	£43,037	£125,941	£187,690	£254,853
Increase (+) or decrease (−)	− £3,566	− £2,162	− £345	− £4,430	+ £6,160
Parcels and misc. traffic receipts (excluding parcels post)	£1,109,604	£213,563	£327,881	£408,307	£136,425
Increase (+) or decrease (−)	+ £38,088	+ £20,573	+ £1,135	+ £14,447	+ £1,249
FREIGHT TRAIN TRAFFIC—					
Freight traffic (tons) (excluding free-hauled)	22,572,906	5,702,971	10,232,119	10,099,921	1,229,465
Increase (+) or decrease (−)	+ 1,976,347	+ 980,943	+ 808,900	+ 552,903	− 2,100
Net ton-miles (excluding free-hauled)	1,289,228,189	250,988,413	431,873,129	519,010,989	53,702,451
Increase (+) or decrease (−)	+ 95,589,521	+ 31,093,500	+ 32,893,034	+ 27,741,609	+ 2,508,669
Average length of haul (miles) (excluding free-hauled)	57·11	44·01	42·21	51·39	43·68
Increase (+) or decrease (−)	− 0·84	− 2·56	− 0·13	− 0·07	+ 2·11
Freight traffic receipts	£7,021,489	£1,258,000	£2,267,239	£2,898,000	£373,925
Increase (+) or decrease (−)	+ £522,222	+ £117,700	+ £247,239	+ £139,000	+ £7,337
Receipts per ton-mile	1·307d.	1·20d.	1·26d.	1·34d.	1·67d.
Increase (+) or decrease (−)	—	− 0·04d.	+ 0·05d.	− 0·01d.	− 0·05d.
Freight train-loads : Average train-load (tons) ..	127·30	137·89	130·64	124·61	104·18
Increase (+) or decrease (−)	+ 3·57	+ 9·21	+ 2·84	+ 1·38	+ 2·03
Net ton-miles—					
Per train engine-hour	995·96	1,072·79	1,043·20	956·32	805·12
Increase (+) or decrease (−)	− 9·68	+ 19·58	+ 5·72	− 40·87	− 5·23
Per shunting-hour	893·34	821·79	974·57	929·17	580·10
Per total engine-hour	470·93	465·33	503·86	471·28	337·17
Net ton-miles per route-mile per working day	2,849	2,943	3,026	3,323	1,158
Increase (+) or decrease (−)	+ 221	+ 366	+ 240	+ 204	+ 33
Wagon-miles. Total	371,129,966	68,062,776	130,952,815	153,700,633	17,816,228
Increase (+) or decrease (−)	+ 18,049,864	+ 5,110,944	+ 7,897,982	+ 6,342,298	+ 261,871
Percentage of loaded to total	67·26	69·01	63·84	69·31	68·35
Wagons per train. Total	34·39	34·76	34·88	34·21	32·10
Increase (+) or decrease (−)	+ 0·01	+ 0·57	− 0·17	− 0·15	− 0·01
Loaded	23·13	23·99	22·27	23·71	21·94
Empty	11·26	10·77	12·61	10·50	10·16
Train-miles. Coaching—Per train-hour	15·26	14·33	14·55	14·64	17·65
Per engine-hour	12·14	11·33	11·19	11·16	14·54
Train-miles. Freight—Per train-hour	9·20	9·45	9·36	8·97	9·41
Per engine-hour	3·70	3·40	3·91	3·79	3·19
Engine-miles. Total	50,346,559	7,950,123	14,123,567	18,776,854	6,621,500
Increase (+) or decrease (−)	+ 1,441,113	+ 261,282	+ 601,412	+ 594,272	+ 110,938
Mileage run by engines. Total train-miles—					
Coaching	25,876,811	3,474,084	6,152,409	8,619,238	4,927,798
Freight	10,792,313	1,958,069	3,754,360	4,492,910	554,970
Engine-hours in traffic. Total	5,266,373	911,282	1,586,808	2,044,379	532,764
Increase (+) or decrease (−)	+ 220,914	+ 51,785	+ 78,860	+ 98,573	+ 5,054
Shunting miles per 100 train-miles—					
Coaching	7·12	6·83	6·38	7·54	7·89
Freight	70·81	83·41	65·55	65·52	94·01

Passenger Traffic Statistics: Number of journeys, receipts, and receipts per journey (excluding season ticket holders)—June, 1937

Subject	Great Britain	G.W.R.	L.N.E.R.	L.M.S.R.	S.R.	Cheshire Lines	Liverpool Overhead	L.P.T.B.†	Mersey
Full fares—									
Pass. journeys ..	33,958,791	710,690	1,217,007	1,607,743	3,105,091	14,780	202,958	26,195,853	76,577
Gross receipts ..	£1,006,874	£82,818	£143,216	£143,688	£256,487	£2,566	£2,162	£359,151	£1,387
Receipts per pass.	7·12d.	27·97d.	28·24d.	21·45d.	19·82d.	41·67d.	2·56d.	3·29d.	4·35d.
Reduced fares—									
Excursion and week-end—									
Pass. journeys ..	47,603,957	5,012,090	11,574,048	17,378,959	9,668,880	485,969	173,098	1,528,556	640,322
Gross receipts ..	£3,332,346	£485,729	£763,176	£1,299,323	£667,448	£30,610	£1,689	£34,519	£10,092
Receipts per pass. journey	16·80d.	23·26d.	15·83d.	17·94d.	16·57d.	15·12d.	2·34d.	5·42d.	3·78d.
Workmen—									
Pass. journeys ..	28,031,956	1,853,168	3,753,593	7,392,340	6,063,724	258,802	219,988	7,341,516	223,266
Gross receipts ..	£412,572	£27,825	£61,457	£120,015	£101,096	£4,511	£1,777	£82,533	£2,044
Receipts per pass. journey	3·53d.	3·60d.	3·93d.	3·90d.	4·00d.	4·18d.	1·94d.	2·70d.	2·20d.
Other—									
Pass. journeys ..	6,208,571	761,981	1,519,756	1,832,492	1,362,962	48,080	46,844	508,843	13,461
Gross receipts ..	£509,161	£77,295	£107,108	£154,252	£156,994	£3,916	£308	£5,074	£233
Receipts per pass. journey	19·68d.	24·35d.	16·91d.	20·20d.	27·64d.	19·55d.	1·58d.	2·39d.	4·15d.
Total—									
Pass. journeys ..	115,868,637	8,350,843	18,081,065	28,242,608	20,204,940	807,879	642,888	35,574,768	953,630
Gross receipts ..	£5,336,823	£690,045	£1,091,510	£1,754,610	£1,187,171	£41,845	£5,936	£481,277	£13,759
Receipts per pass.	11·05d.	19·83d.	14·49d.	14·91d.	14·10d.	12·43d.	2·22d.	3·25d.	3·46d.

* All standard gauge railways † Includes passengers originating on the railway undertakings, and on the Whitechapel and Bow Joint Railway

THE PROBLEM OF LUBRICATION

A review of the Mechanical Engineers' General Discussion

THE problem of lubrication is one of fundamental importance to the railway mechanical engineer, and the General Discussion on Lubrication and Lubricants on October 13-15, arranged by the Institution of Mechanical Engineers, is therefore of considerable importance to those concerned with railway operation. Knowledge of the mechanism of lubrication, despite its fundamental importance in all mechanical engineering, cannot yet be regarded as satisfactory, either in theory or technique. The inconsistent requirements of various official specifications for lubricants, for instance, or the misleading results often given by widely used tests for oils, are an indication of this. The reason lies in the intrinsic difficulties of the subject, investigation of which takes us into the realm of atomic physics. It is certainly not due to lack of painstaking research; but the fundamental factors involved have still to be sorted out, so that experiments often fail to give results from which general principles can be deduced, and sometimes tend to become an unknown measure of the conditions under which they are conducted. An opportunity of surveying the work accomplished is therefore a valuable preliminary to further progress.

The railway engineer is interested mainly in journal bearing and cylinder lubrication. The 140 or so papers contributed to the discussion are divided into four groups, of which the first deals with Journal and Thrust Bearings. Several papers in this group are of direct practical interest to the railway mechanical engineer. Herr E. Falz, for instance, in summarising the principles of the design of journal bearings, devotes considerable attention to the methods of distributing the oil and shows that the oil grooves extensively used until recent years in railway bearings not only fail in their purpose but reduce the load capacity and reliability of the bearing. Mr. W. A. Stanier, of the L.M.S.R., in a paper in the same group confirms this and describes and illustrates an axlebox bearing representing the latest practice of one railway, in which the oil is fed from a mechanical lubricator through a row of holes on the horizontal centre line on each side of the box, thus obtaining an unbroken whitemetal bearing surface. Another railway has entirely removed the feed to the brass and is experimenting with a felt pad, in place of the worsted spring pad. Professor George Karelitz discusses the practical question of the oil supply in bearings, with reference to end leakage, and devotes some attention to waste-packed bearings of the railway type. He concludes that it is desirable to use lubricant of high viscosity and to control the oil-lift to minimise the amount of oil fed to the journal where space limitations do not allow the use of proper oil seals to prevent loss. Bearings of this type, Professor Karelitz states, work distinctly in the semi-fluid range of lubrication and the load is carried partly by direct metal-to-metal contact. The design is dictated by limitations of space and a comparatively rapid rate of wear is inevitable. Mr. J. Foster Petree, however, describes some special designs of axlebox bearings recently evolved on the Continent and gives test results which it is claimed show that true fluid lubrication conditions are obtained. This is achieved by the use of an under-brass clear of the journal but close enough to retain a reserve of oil when standing, which is carried to the upper-brass immediately movement takes place. This under-brass also limits the separation of the journal and upper-brass, and thus prevents breakage of the oil film due to "jump."

In Group II, dealing with Engine Lubrication, there are pages by M. Chatel of the French State Railways, Mr. S. J. Hungerford of the Canadian National Railways, Professor Nordmann and Herr Robrade of the German State Railway and Mr. W. A. Stanier, all naturally of direct interest to the railway engineer. Mr. Hungerford's paper is chiefly a summary of specifications of oils and greases suitable for the extremes of temperature characteristic of the Canadian climate. Professor Nordmann also gives particulars of the oils used by the German State Railway, including a high-class oil used specially to lubricate a streamline locomotive on trial runs up to 125 m.p.h. The papers by M. Chatel and Mr. Stanier are devoted mainly to the problem of locomotive cylinder lubrication. Mr. Stanier is of opinion that some part is played in cylinder lubrication by the graphite in the cast iron, though Mr. J. G. Pearce of the British Cast Iron Research Association, in a separate contribution on the wear of cast iron, states that little weight is now attached to the lubricating effect of graphite *per se* in cast iron, although the cavities may act as minute oil containers. Mr. Stanier gives 0·00033 in. per 1,000 miles as an average figure for the cylinder wear of an express engine, and M. Chatel gives the interesting information that to obviate the difficulty inherent in the systematic measurement of wear in service, it is proposed to install a special test bench which will simulate the work of the piston rings and cylinder under definite conditions of temperature and lubrication, thus carrying out a recent suggestion that locomotive cylinder performance might be studied in this way.

In Germany pumps have almost completely superseded the hydrostatic lubricators formerly employed for cylinder lubrication, and in France this is also the case for modern locomotives working with high superheat. Mr. Stanier, however, describes one or two modernised forms of hydrostatic lubricator to meet modern conditions. The main difference between the characteristics of the two methods is, of course, that the mechanical lubricator delivers a definite quantity of oil for every mile run, whereas in the hydrostatic system the oil is delivered purely on a time basis, though the feed can be adjusted by the driver to suit special conditions. Mr. Stanier reports that the trouble of carbonisation practically disappeared with the introduction of atomisation of the oil and after steps had been taken to reduce the vacuum created when coasting by the provision of suitable steam-chest air valves and by admitting a breath of steam to the cylinders with the valve gear at about 45 per cent. cut-off. It has been proved that cylinder carbonisation occurred when coasting as a result of the sucking in of hot gases from the smokebox which burned away the oil film.

A question of vital importance at the present time, is the effect which high-speed running and enclosure of bearings by streamlining will have on the problem of lubrication. Mr. Stanier gives an account of some temperature measurements of an axle bearing under running conditions which gives an indication that the answer is that there will be no serious difficulty provided greater attention is paid to the mechanical perfection of bearings for high-speed streamline trains. The temperature variations due to increased speed were considerably less than those between different bearings. Moreover a statistical analysis of the causes of hot bearings showed that defects in the bearings or in the locomotives, causing abnormal conditions in the bearings, preponderated.

NEW STEAM BREAKDOWN CRANE FOR THE SOUTH INDIAN RAILWAY

Built by Cowans Sheldon & Co. Ltd. for the metre-gauge section, this new crane is replete with modern equipment, including a very useful electric lighting set and floodlights

THE steam breakdown crane illustrated has recently been built by Cowans Sheldon & Co. Ltd., of Carlisle, and supplied to the South Indian Railway for use on the metre-gauge section. The crane is of the self-propelling type, with lifting, derricking, slewing, and travelling gears. In the propped-up position it is capable of lifting 35 tons at 18 ft. radius; without the aid of propping girders the lifting capacity is 7 tons at the same radius. With the jib at a radius of 18 ft., the crane can travel at a speed of about 100 ft. per min. The height of lift above rail level at 18 ft. radius is 25 ft.

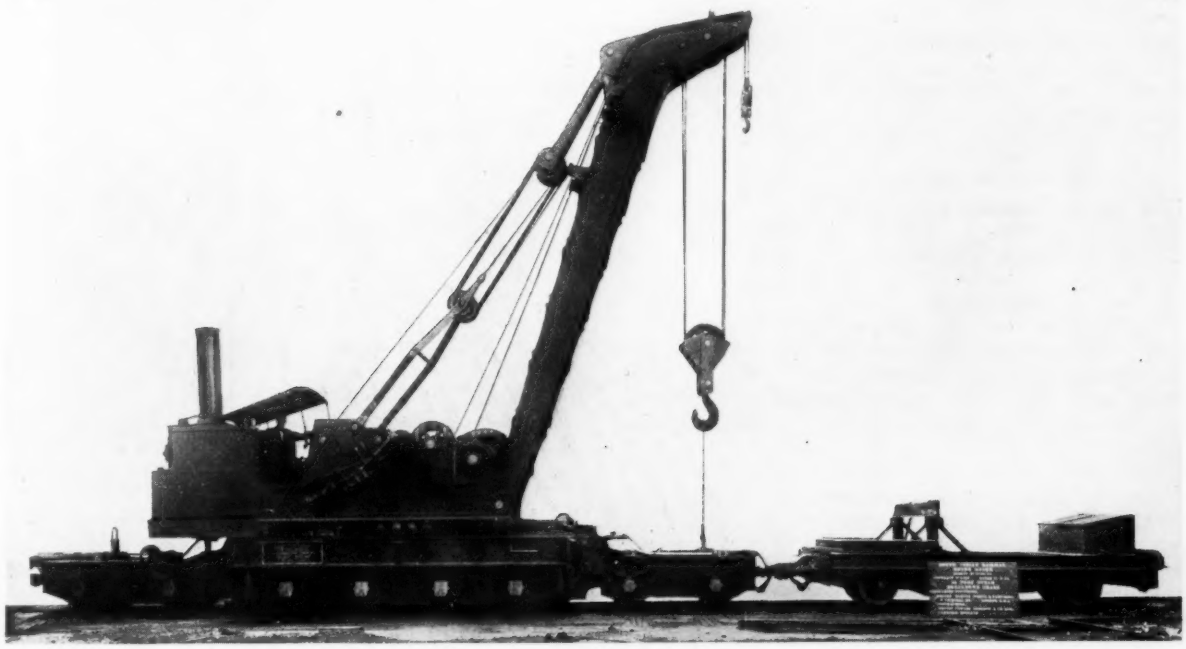
The crane is equipped with a Hopwood squat-type vertical boiler, the chimney of which is hinged so that it can be lowered below the moving dimension line, 11 ft. 3 in. above rail level, when running on trains. The driver's canopy is fitted with a hinged roof adjustable to any height of lift above rail level at 18 ft. radius is 25 ft.

A suitable match wagon with a complete electric lighting equipment are also supplied with the crane, and telescopic propping girders fitted with jacks and locking gear for use when the crane is travelling on a train have been provided. The crane is stable with the jib at minimum or maximum radius and in any position.

The axle load of the train was restricted, under the specifications, to a maximum of 10 tons, so as to enable the crane to run on trains. To attain this end, relieving girders have been provided to reduce axle loads. The crane is fitted with standard type non-shock couplers (IRS type) made by the A.B.C. Coupler & Engineering Co. Ltd.

The match wagon, which can be coupled up at either end of the crane, is of a design capable of traversing the sharpest curve when coupled to the crane with jib in position for travelling, without any part of the jib or other apparatus infringing the moving dimension. The wagon is large enough to accommodate all the gear normally required in breakdown service.

The brakes are of the hand-wheel and screw type operated from either side, and a vacuum train pipe complete with hoses, couplings, &c., is fitted up. A friction brake has been provided to control the slewing gear, and the brake for holding the load is worked by a hand lever conveniently designed to fit in with the other control arrangements.



New breakdown crane for the metre-gauge section of the South Indian Railway

Electric Lighting Equipment

The electric equipment consists of a 32-V., 550-W. turbo-generator, suitable for developing its full output at any steam pressure from 60 to 120 lb. per sq. in.; one 14 in. floodlight with 250-W. lamp mounted on the jib; one cluster fitting with three 15-W. lamps mounted at the top end of the jib; and lamps for driver's cab; water and pressure gauges, and two portable hand lamps each fitted with 100 yd. of flexible cable. Four plug points for the hand lamps are provided, one at each corner of the crane, as also two drums for winding the flexible cable. There is also supplied a metal ship's fitting with 12-in. reflector, adapted for standing on the ground or hanging on a hook, complete with metal guard and 250-W., 32-V. headlight lamp.

POWER SIGNALLING AT THE GARE DU NORD

Large new route-lever installation in Paris

EARLY last year the Chemin de fer du Nord brought into full service the new power signalling installation at the Gare du Nord, Paris, replacing the three mechanical signal boxes formerly in use, constructed in 1885, 1896, and 1899. They had reached the limit of their capabilities, and it was impossible to introduce any further improvements in them with any prospect of success. The adoption of an all-electric installation was therefore decided on, and the following particulars, taken from our contemporary, *Revue générale des Chemins de fer* will give some impression of the work involved. The accompanying diagram shows the extent of the layout, and the position of the old and new signal boxes.

Choice of system

The M.D.M. (*minimum de manœuvre*) route lever apparatus, already widely used on the Nord, was selected, and it was at first proposed to have one large box; but a study of the traffic movements, which are such that there are practically two stations in one, showed that two signal boxes, with zones of action limited as shown on the diagram, would be preferable. Each thus has a good view of the lines controlled, helpful in the case of any failure arising, especially in view of the large number of shunt movements, in the yard due to the use of steam traction. The two zones consist broadly of the main line departure and western and northern suburban lines (Zone 1); and the main line arrival, eastern suburban and Gennevilliers local services. Between these there is not much movement in common. Steam traction has necessitated the provision of a number of "*sas*" or short sections, where locomotives may stand and cause the least inconvenience to other traffic.

The principle of the M.D.M. lever frame is well known. (An illustration of a small one appeared on page 322 of our issue of February 19, 1937.) There are, of course, no point levers. Point control contacts are operated by slide bars in the apparatus, each consisting of a framework with specially shaped openings cut in it, through which pass spindles driven by the route levers. Cams mounted appropriately on the spindles drive or hold the slide bars concerned in each particular route, so that interlocking becomes unnecessary, combining the electrical simplicity of individual lever working with the route lever principle. In the present installation there are 794 routes—*i.e.*, distinct train or engine movements—to be controlled, which with the principle of one lever movement per train movement,

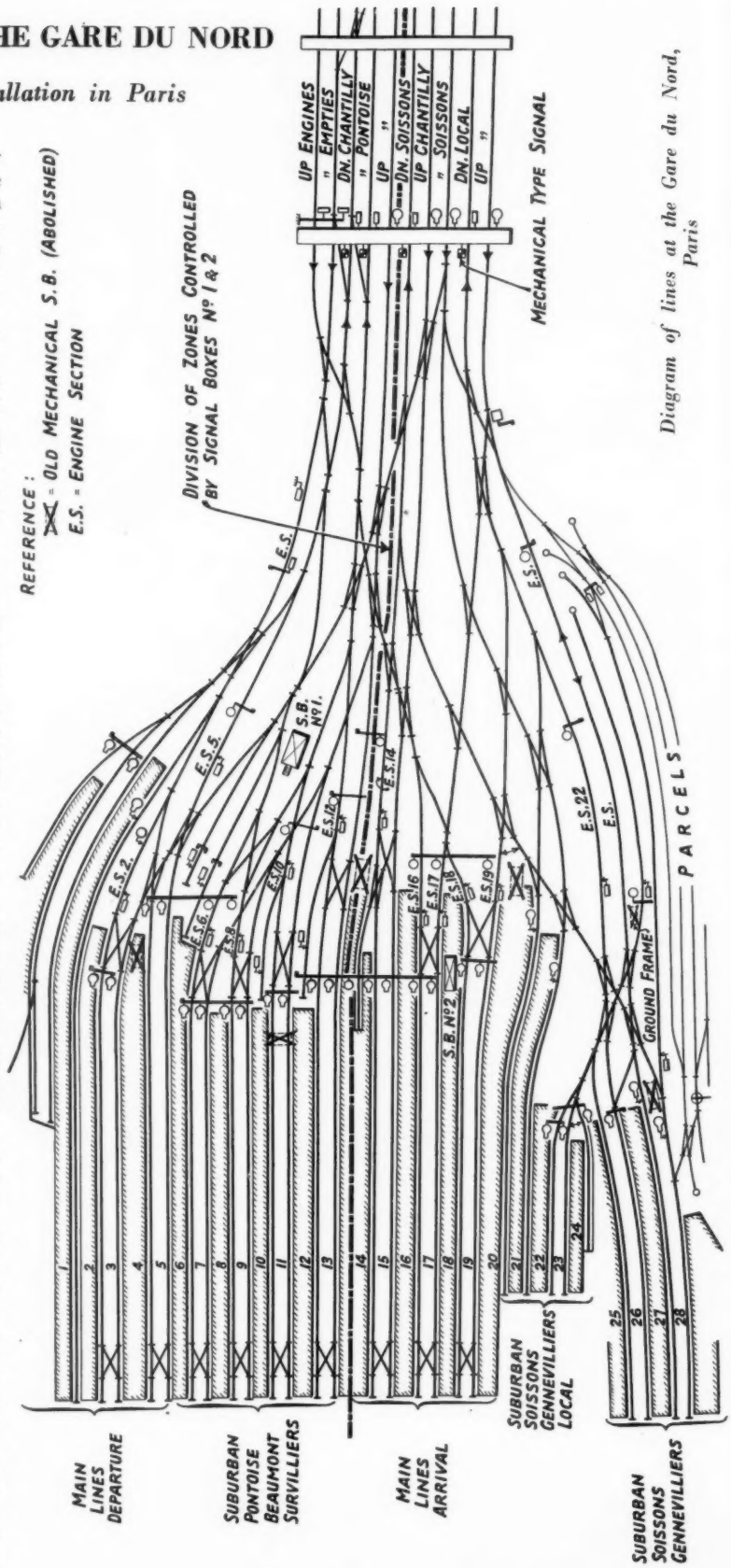


Diagram of lines at the Gare du Nord, Paris

would have necessitated 397 levers, if made " push and pull." It was accordingly decided to use the principle, long known in the mechanical signal boxes on the Nord, of *directeur* and *trajecteur* levers, according to which the routes are divided at a number of key points, and to operate more than one lever for certain movements. In this way the total number of working levers for this large station of 28 platform lines, involving 160 pairs of points, excluding platform crossovers and 77 signals, most of which read for a number of routes, has been kept at 148 (70 in Cabin 1, 78 in Cabin 2), plus 42 spares. Full sectional route locking is provided, simplified by succession locking between the route handles for certain movements, with direct point locking in addition in some places. Signals are automatically replaced to danger by the track circuiting, which extends throughout the area, but where trains are propelled this action is specially delayed until the locomotive has passed. A call-on indication cannot be given for an occupied platform line unless the approaching train has come nearly to a stand, and not if there is insufficient clear space to receive it.

Illuminated Diagrams

These are of the normally dark pattern, with red light for " track occupied." When a route is set up it is lighted in white, if the points are all correctly set. Should a pair not be, the white light will not be shown beyond, but a yellow bull's eye will light up next to them on the diagram and an alarm will sound. As a movement proceeds along a route the track sections of course become red. The diagrams also include signal repetition, slot indications, and other subsidiary features. Telephone and describer equipment is provided to communicate with adjacent signal boxes.

Signals are of the colour-light type, and the majority are multiple-aspect; those requiring to be seen a short distance only have small lenses. Voltage is the same, day or night. The lamps have reserve filaments. The new French standard code of aspects is used. All gantries and bridges are of welded construction and have a particularly neat appearance. The absolute stop sign " NF " (*non-franchissable*, see THE RAILWAY GAZETTE, July 3, 1936, page 5) is attached to all signals. The electric point detectors are of the Mors spring plunger bolt type, requiring no rod connections to the switch tongues.

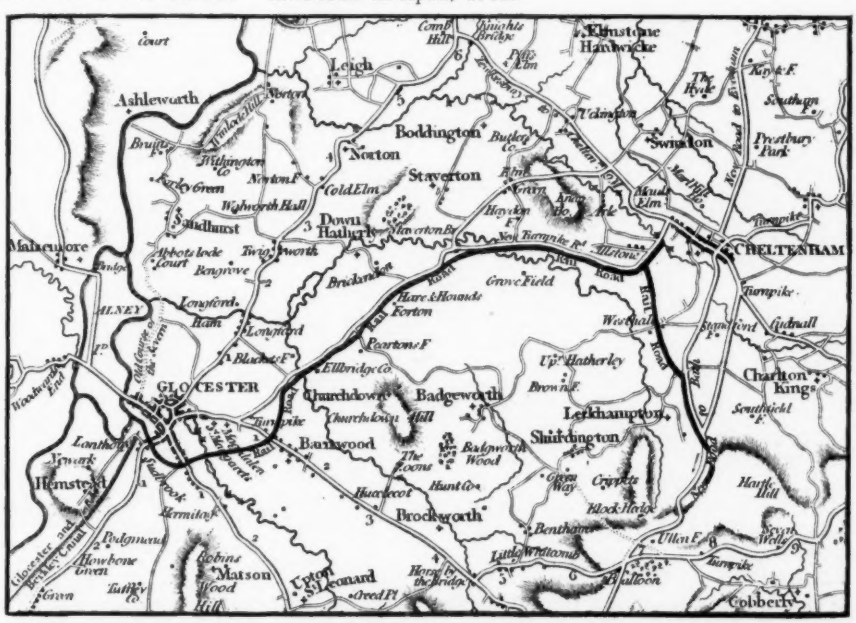
Signal Boxes and Power Supply

The new signal boxes, of concrete and steel, are of very neat design, with large deep windows all round, affording an excellent view, which, in spite of the track circuiting, is thought useful with the type of traffic to be dealt with. Special care has been taken to ensure continuity of power supply. Point machines are operated on d.c. at 110 volts, and low voltage d.c., or a.c., is used for the remaining functions, as most suitable, supplied from a special substation. Two separate main cables connect the latter with a district supply network, and there is to be a third connection to another such supply shortly. Two groups of converter machines are provided, one normally in reserve. If the main supply fails the a.c. can be taken from a converter set, driven from the accumulators, a petrol generating set being started up to charge the latter. Should the converter and engine sets all fail, d.c. can be taken from a rectifier, used to charge the accumulators for the luggage trucks, and a.c. from the local low voltage supply mains.

This important installation was brought into service in two stages, namely, No. 1 signal box on October 19, 1935, and No. 2 on February 29, 1936; a small section of the latter was, however, opened on July 20, 1935, to enable the old No. 3 box on the east side to be closed.

The Gloucester & Cheltenham Railway

During the past session the proceedings of the various technical institutions have contained more than one reference to the original railway between Cheltenham and Gloucester. This line, which was one of the earliest public railways, was formed under an Act of 49 George III, cap. 23, April 28, 1809. The company thus incorporated—the Gloucester & Cheltenham Railway Company—was authorised to build a railway or tramroad from the River Severn at Gloucester to Knapp toll gate, Cheltenham; and a branch from Cheltenham to join an existing quarry tramroad at Leckhampton Hill. Work was begun in November, 1809, and on July 2, 1810, the Leckhampton—Cheltenham section was opened with ceremony. Another ceremony marked the formal opening of the Cheltenham — Gloucester main line on June 4, 1811. The Birmingham & Gloucester Railway Act of April 22, 1836, enabled that company and the Cheltenham & Great Western Union Railway to buy the tramroad shares, each paying £17,500 for a moiety in the early days of 1837. Very little of the early track was converted for steam traction, and the line continued in use for horse vehicles until its abandonment under an Act of August, 1859. The rails, &c., were auctioned in April, 1861.



The route of the Gloucester & Cheltenham Railway as shown in John Cary's " New Itinerary " seventh edition, 1817

FRUIT AND FLOWER TRAFFIC, SOUTHERN RAILWAY

A brief description of this traffic from Worthing and district to London Bridge, whence it is sent by road to Covent Garden market or to other London termini for dispatch to the Midlands

IN the triangular area of which the apices are Chichester, Billingshurst, and Southwick, on the Central Section of the Southern Railway and in the County of West Sussex, there are well over 600 fruit-, flower- and vegetable-growers who are represented by Worthing & District Growers Limited, and who send most of their produce by the railway to London Bridge station. In our issue of September 17 we quoted, in the course of an editorial note, a report made by representatives of this body, to the local branch of the National Farmers' Union upon the methods of handling this perishable and important traffic. From personal observation we can fully endorse the extremely commendatory remarks embodied in that report, and as some further details of this traffic may be of interest we give them below.

Apart from numerous small consignments arriving by electric, and other passenger and parcels trains, there are three special trains daily which—though not reserved entirely for perishables—discharge the produce from the market gardens of West Sussex at London Bridge. These arrive at 2.22, and 11.2 p.m., and 12.0 midnight; the former also brings produce destined for the Midlands, whereas the other two feed Covent Garden and other London markets. It is interesting to note that the 11.2 starts from Angmering and runs *via* Hove and Preston Park, while the 12 (midnight) starts from Brighton and runs *via* Steyning and Horsham, and it is these two trains that carry the great bulk of the traffic, the 11.2 in particular.

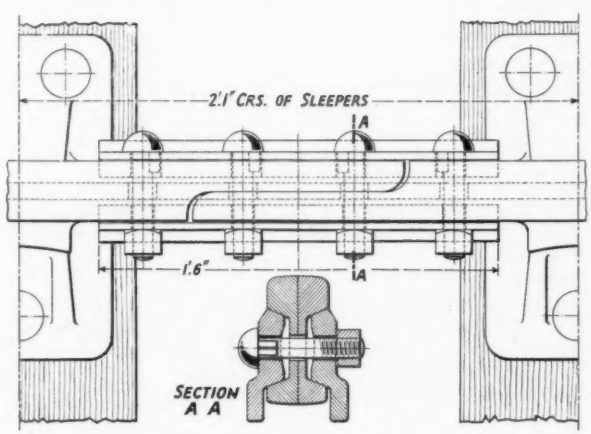
To give some idea of the volume of this traffic it will be seen from the figures below that well over a million packages of fruit and flowers have been brought from West Sussex to London Bridge during the past 12 months, September, 1936, to August, 1937, inclusive:—

NUMBERS OF PACKAGES OF FRUIT AND FLOWERS FROM WORTHING AND DISTRICT RECEIVED AT LONDON BRIDGE AND FORWARDED BY ROAD

Month	To London Markets	To the Northern Railway Termini
1936		
September	87,850	4,638
October	92,197	3,200
November	94,399	3,113
December	90,001	5,567
1937		
January	43,355	3,265
February	38,346	2,886
March	35,972	3,366
April	53,768	2,910
May	100,622	11,933
June	151,378	20,085
July	156,628	24,521
August	133,325	6,864
Totals for the year ..	1,077,841	92,348
	92,348	
Grand total (all destinations)	1,170,189	

As will be observed, the heaviest month of the twelve was July, when over 180,000 packages were dealt with at London Bridge. As a matter of fact, the highest daily total happened to be on the night of July 5-6, the night on which the fruit-growers' representatives paid their surprise visit to London Bridge. Between 11 p.m. on the 5th and 3 a.m. on the 6th, no fewer than 9,140 packages of fruit and flowers arrived by the 11.2 and 12.0 trains and were carted thence to Covent Garden and other London markets in 27 motor vehicles. Other nights nearly, but not quite, attained this figure. The staff employed for unloading from the trains and loading into road vans for delivery consists of 1 inspector, 1 foreman and 33 porters.

We recently saw the arrival—punctually—and discharge of the 2.22 p.m. train at London Bridge, which, though much lighter than the night trains, provided a good subject for photography, to show how well, systematically, and completely the boxes and baskets are loaded in the parcel vans, how carefully they are handled, and loaded on the platform trucks and thence transferred to the road vehicles (partly horse-drawn and partly motor). Our illustrations also give an idea of the variety of the packages; the larger boxes contain flowers, the smaller, long-shaped ones, also flowers of delicate species, the small square boxes with the labels on the ends are filled with tomatoes, and the round and handled baskets contain fruit. It will be noticed that the road vehicles are well and carefully loaded to the roof like the rail vans. This afternoon traffic goes on by road mainly to King's Cross, St. Pancras, Euston and Paddington in time to catch the various express trains for the Midlands and other areas served by those termini, so that Sussex produce arrives there in time for the early morning markets. The Southern Railway is to be complimented upon the organisation that makes possible the handling of this delicate traffic in such bulk and yet without damage to it, and the clockwork regularity of the service provided. (It will be remembered that the growers' representatives found that such delays as occurred were not due to the railway but to lack of van unloading space at Covent Garden.) This special traffic is in addition to, and quite separate from, the ordinary parcels, luggage-in-advance, &c., transferred at London Bridge to and from other companies, which is exceedingly heavy, especially at week-ends during the summer months.



Four-bolt fishplated Brogden joint. It is this type that has been adopted by the L.P.T.B. for joining the long welded lengths of rail to be used as standard on the tube railways in future

Boxes of chrysanthemums in van on arrival and about to be unloaded; note the orderly loading and full use of the space

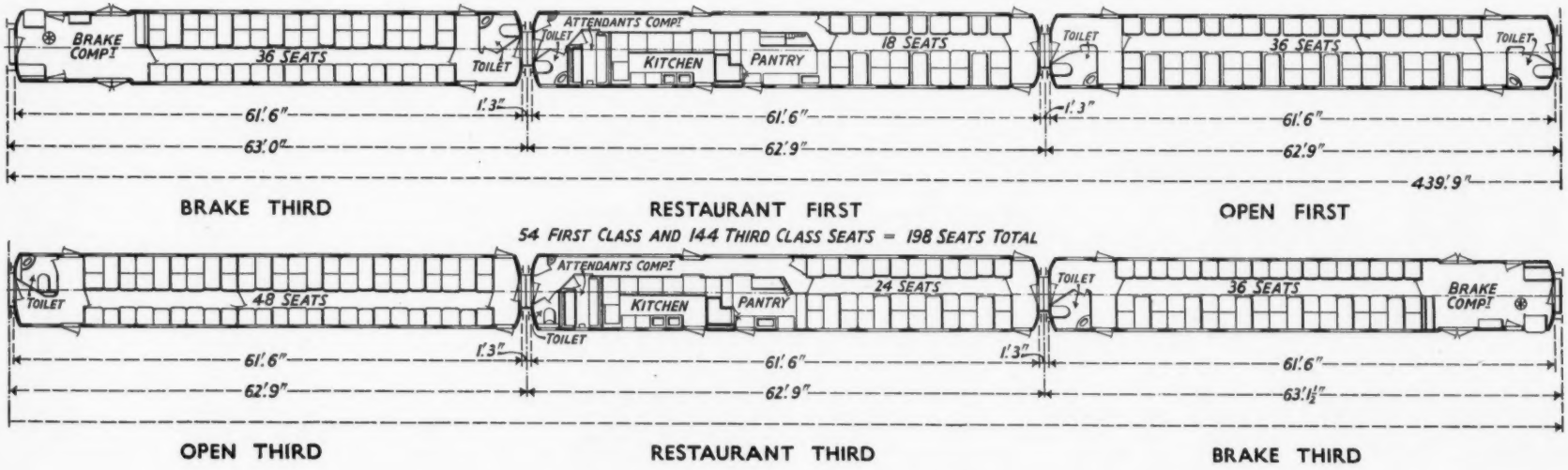
Loading boxes of chrysanthemums into road van. Here again the regularity in loading and use of full capacity of the van may be noted

Grapes (in baskets), tomatoes (in labelled boxes), and chrysanthemums in background being transferred from rail to road vehicle

Transferring chrysanthemums from rail to road van. As in the other illustrations, the careful handling of every package will be noticed

TRANSFERRING FRUIT AND FLOWER TRAFFIC FROM RAIL TO ROAD AT LONDON BRIDGE, SOUTHERN RAILWAY

The East Anglian, headed by streamlined 4-6-0 locomotive No. 2859 "East Anglian"



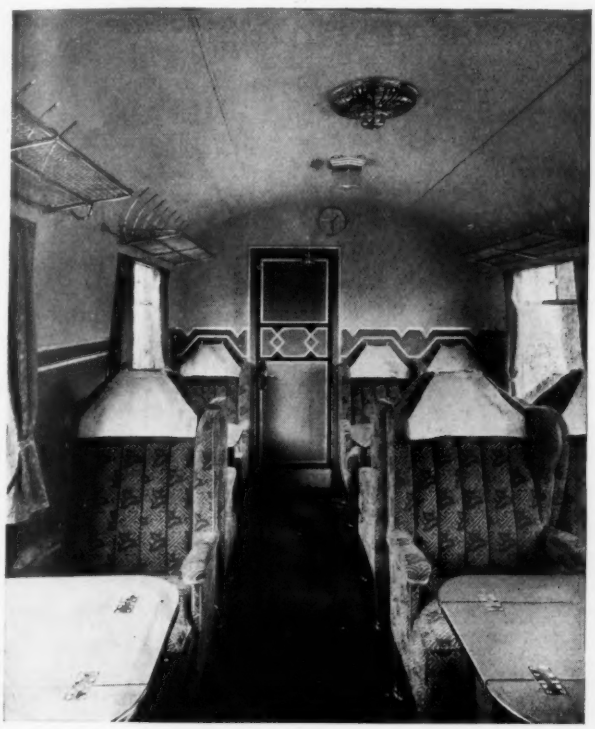
Formation and seating-arrangement diagram

THE EAST ANGLIAN EXPRESS, LONDON AND NORTH EASTERN RAILWAY

THE EAST ANGLIAN EXPRESS

A notable addition to the Norwich-Ipswich-London train service

WITH the inauguration of the winter timetable on September 27, the L.N.E.R. placed in service the East Anglian, a new fast train between Norwich, Ipswich, and London (Liverpool Street). For this service a six-coach set has been constructed at York carriage works to the designs of Sir H. Nigel Gresley, Chief Mechanical Engineer. The carriages are of the open type



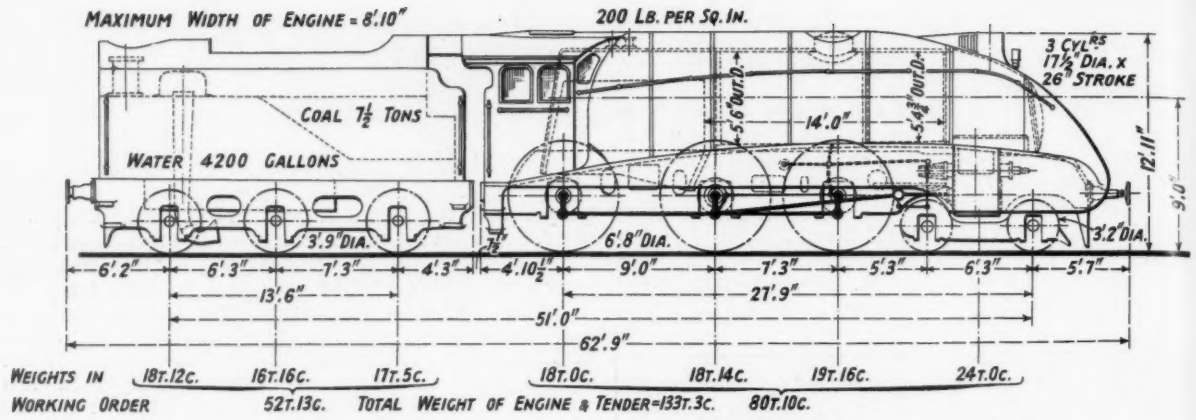
First class saloon on the East Anglian

with standard 60-ft. steel underframes and teak-framed body, and have exterior panelling of the company's standard varnished teak. In other main constructional respects, too, they follow L.N.E.R. standards, having Pullman-type vestibules and buckeye couplers and being carried on compound bolster bogies. The formation and layout of the train, which weighs 219 tons, is as shown in the accompanying diagrams. Seating accommodation is provided for 54 first and 144 third class passengers and no supplementary fares are charged. No separate restaurant car accommodation is provided and the passenger can take meals at the seat which is allotted for the journey.

The scheme of interior decoration was designed for the company by Mr. Murray Adams Acton of Acton Surgey Limited, and in many respects follows the style of the Coronation and West Riding trains. The first class cars are lined with Rexine of a stone colour above the high waist line and with green Rexine below, and the junction of the two colours is covered with strips of plain and gold coloured Alumilite. The doors are covered with green Rexine outlined in red Rexine and decorated with ornamental features in Alumilite. A deep rose and gold moquette covers the seats, and a mulberry-coloured carpet over a $\frac{1}{2}$ in. thick sponge rubber underlay the floor. At each window are two silk brocade curtains. A roof light in an Alumilite fitting is placed in the ceiling over each section, and net racks are provided along the cantrail. The third class saloons are also decorated in Rexine, the colours chosen being light stone colour above and a shagreen finish below the waist line which is covered by strips of Alumilite. Ornamental designs in this material are also placed on the doors. There is a green aisle carpet between the seats and the remainder of the floor is covered with green cork lino. The seats, of similar design to those of the West Riding and Coronation trains, are upholstered in fawn uncut moquette to tone with the general scheme of decoration. In both first and third class portions of the train the seating is arranged with two passengers on one side of the gangway with one on the other, and to facilitate movement into and out of the double seats, the tables have hinged flaps.

Steam heating is fitted throughout the train; large sliding shutter ventilators are provided above each of the large side windows, and torpedo ventilators in the roof. To make the service of meals to all seats in the train as convenient as possible, two kitchens have been provided, each equipped with electric cooking apparatus of the most modern type, designed and supplied by J. Stone & Co. Ltd. and Henry Wilson & Co. Ltd. The equipment in both kitchens is identical and consists of the main cooking range, comprising roasting and steaming ovens, two

Third class saloon on the East Anglian



Streamlined B17 "Sandringham" class locomotive for the East Anglian service, L.N.E.R.

grills and a boiling table having four hot plates. A separate fish fryer is also provided and a vegetable boiler is arranged near the electrically heated sinks on the body side. An automatic water boiler including coffee and milk urn manufactured by W. M. Still & Company is arranged alongside the hot cupboard on the corridor partition and an automatic refrigerator having separate compartments for iced wines, butter, cheese and general provisions is also fitted. The necessary power is obtained from two 10-kW. axle-driven generators suspended under each kitchen car in accordance with L.N.E.R. standard practice and supplying power at 180-225 V. An Exide ironclad battery of 210 amp. hr. is provided on each car for use when the train is standing. The usual pantry accommodation is also provided, and the table linen, glass, crockery and silver are of distinctive design in keeping with the special character of the train. A feature is the wide corridors and ample circulating space at the ends of the carriages permitting unhampered movement of the passengers when joining and leaving the train.

The first class lavatories are decorated in blue Rexine fading out from dark at the bottom to pale blue at the ceiling. The wash basin and hopper are of white porcelain, and the interior fittings chromium plated. In winter the water is heated by steam, but in summer heat is obtained from an electric immerser supplied from the train lighting dynamos. The floor is covered with Korkoid to match the walls. The third class lavatories are fitted out like the first, except that the prevailing tone is a biscuit colour, cream and brown Rexine, with the lower portion brown.

Two 4-6-0 locomotives Nos. 2859 and 2870 of the B.17 "Sandringham" class have been streamlined for service on this train and re-named *East Anglian* and *City of London*. They are painted the L.N.E.R. standard green.

The overall average speed of the East Anglian express between London and Norwich, including a 4 min. stop at Ipswich, is 51 m.p.h., and between Norwich and London 51·6 m.p.h. The train runs daily from Monday to Friday in each direction, leaving Norwich at 11·55 a.m. and Liverpool Street at 6.40 p.m., completing the journey between the two cities in 2 hr. 15 min.

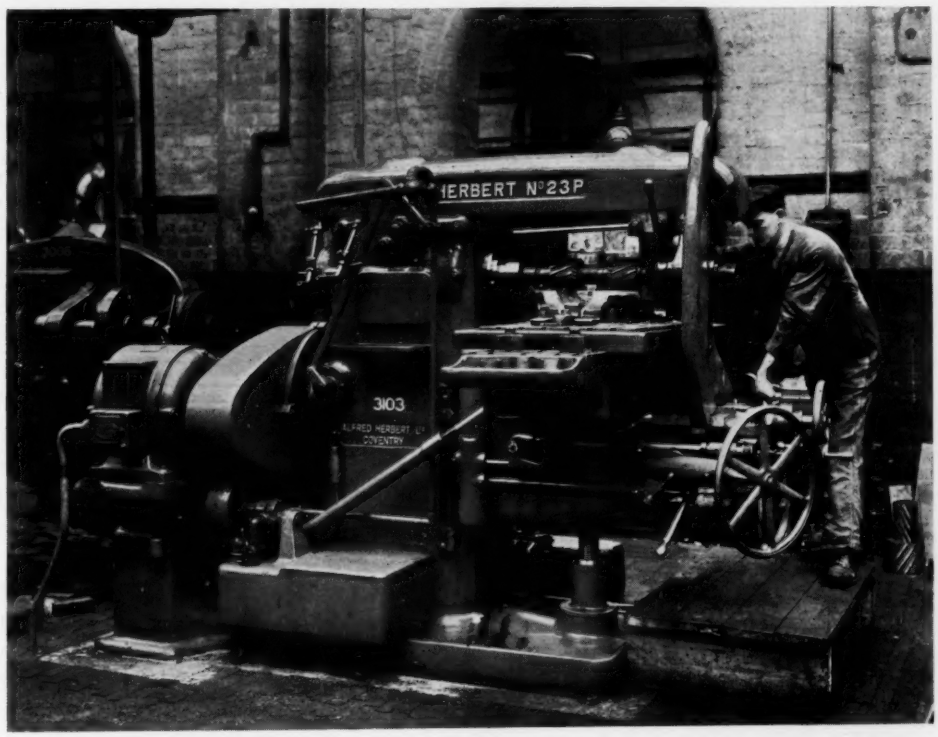
The following is a list of the firms concerned in the supply of equipment for the new train:—

Side bearing springs: Willford & Co. Ltd.
Bolster springs: Turton Brothers & Matthews Limited.
Hosepipes and vestibule diaphragms, springs: G. Spencer Moulton & Co. Ltd.
Paints: Robert Kearsley & Co. Ltd.; Docker Brothers.
Electric cooking equipment: J. Stone & Co. Ltd.; H. Wilson Limited.
Electric cooking batteries: J. Stone & Co. Ltd.
Coffee machine; stainless steel sinks: W. M. Still & Sons Ltd.
Train lighting equipment: J. Stone & Co. Ltd.; Pritchett & Gold & E.P.S. Co. Ltd.
Train lighting cells: Pritchett & Gold & E.P.S. Co. Ltd.
Steam heating and vacuum couplings: Lightalloys Limited.
Insulation for floors, walls, heating pipes: J. W. Roberts Limited.
Aluminium decoration: Alumilite Limited.
Rexine: I.C.I. (Rexine) Limited.
Upholstery materials (Ordered through Messrs. Acton Surgey Limited): J. Holdsworth & Co. Ltd.
Carpets: T. F. Firth & Sons Ltd.; Carpet Trades Limited.
Seat spring fillings: Vi-Spring Products Limited.
Armrests: Dunlop Rubber Co. Ltd.
Sliding shutter ventilators: J. Beresford & Sons Ltd.
Locks and latches: J. Kaye & Sons Ltd.
Lavatory floors: Korkoid Decorative Floors Limited.
Refrigerators: British Automatic Refrigerator Co. Ltd.
Hopper and flushing cisterns: Twyfords Limited.
Wash bowls: Doulton & Co. Ltd.
Inside fittings: W. M. Still & Co. Ltd.; N. F. Ramsey.
Plywood: London Plywood Company; W. A. Swales & Co.; Montague L. Meyer & Co. Ltd.
Glass and mirrors: Pilkington Brothers.
Triplex glass: Triplex Safety Glass Co. Ltd.
Clock: H. Hughes Limited.
Vacuum brake apparatus: Vacuum Brake Co. Ltd.; Westinghouse Brake & Signal Co. Ltd.

NEW POST OFFICE SORTING VANS, L.M.S.R.—The L.M.S.R. has recently constructed at its Wolverton carriage works three additional Post Office sorting vans. These new vehicles, which are similar to those described and illustrated in THE RAILWAY GAZETTE of September 7, 1934, are each 60 ft. in length and weigh in working order approximately 33 tons. In addition to extensive sorting racks and desks net and traductor apparatus is fitted to enable mail bags to be exchanged at speed with ground apparatus. The underframe and bogies are of steel, built to the company's standard designs. Teak is used for the body framing, with part of the cantrails in Borneo mahogany and jarrah, and the outer sides of the body are sheeted with steel panelling. The exterior presents a flush finish, is painted in L.M.S.R. standard colours, and bears the wording "Royal Mail" and the royal cypher on each side. A posting box is provided for late-fee letters. Deal casing is the finish for the interior, the sides of which are painted a special shade of green to avoid eyestrain. The personal comfort of the travelling Post Office staff has been specially studied. For their benefit an electric tea urn and an oven has been installed, and special draught-excluding curtains and noise-reducing fireproof floors provided.

MILLING LOCOMOTIVE COMPONENTS

DURING a recent visit to the Crewe works of the L.M.S.R., when we inspected several machine tools recently installed there, we noted the excellent work performed on the Herbert No. 23P high-power plain milling machine. This is used for milling various locomotive components such as reversing shaft brackets, expansion angles, eccentric sheaves, and similar parts. The photograph reproduced* shows the machine milling steam pipe stuffing boxes, the halves of which are handled together. The operation consists of two cuts, one roughing and one finishing; the roughing is done at a speed of 60 ft. per min. with $\frac{1}{4}$ in. depth of cut and feed of $1\frac{3}{16}$ in. per min.; and the finishing cut is at a speed of 80 ft. per min. with a cut of 0·017 in. and feed of $2\frac{3}{4}$ in. per min.

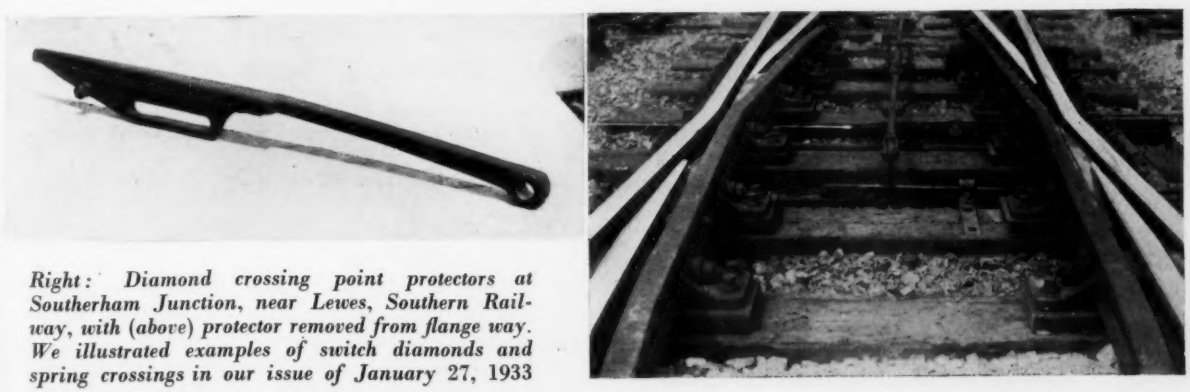


Herbert milling machine at work at Crewe works, L.M.S.R.

This exceptionally powerful machine has sufficient strength for the heaviest work within its capacity. The design incorporates every provision for convenience and quick handling which the maker's experience in building and using milling machines has suggested. The provision of ball and roller bearings to the main spindles affords several advantages, viz.: (1) permanent alignment of the spindle throughout the life of the machine; (2) higher speeds and heavier feeds, resulting in much more rapid production; (3) full rigidity and therefore absence of chatter; (4) lower frictional resistance, resulting in increased power at the nose of the spindle; and (5) no adjustment is required, and lubrication is necessary only at long intervals. In this machine there are sixteen spindle speeds ranging from 16·5 to 427 r.p.m., and the eighteen feeds range from $\frac{5}{8}$ in. to $22\frac{1}{2}$ in. per min. Quick power motion of 150 in. per min. is provided to the longitudinal motion of the table. This is one of several machines of different types supplied by the same firm, Alfred Herbert Limited, Coventry.

* By the courtesy of Mr. W. A. Stanier, Chief Mechanical Engineer, L.M.S.R.

Diamond Crossing Point Protectors



Right: Diamond crossing point protectors at Southerham Junction, near Lewes, Southern Railway, with (above) protector removed from flange way. We illustrated examples of switch diamonds and spring crossings in our issue of January 27, 1933

Rebuilding Euston

Sir Josiah Stamp laying the foundation stone of the new flats to accommodate L.M.S.R. tenants displaced for the rebuilding of Euston station. The ceremony, which took place on Thursday, October 7, was referred to in an editorial note on page 594 last week

The Swanley Accident, Southern Railway

(*See Ministry of Transport report on page* 656)

Above: Telescoped carriage in the up Margate-Victoria train

Left: The scene after the accident showing the demolished substation and the smashed empty carriages that had been standing in the siding into which the Margate train ran. Swanley Junction signal box is on the left

RAILWAY NEWS SECTION

PERSONAL

G.W.R. Appointments

The following appointments, effective from Monday last, October 11, are officially announced by the Great Western Railway:—

Mr. K. W. C. Grand, Divisional Superintendent, Swansea, to be an Assistant to the General Manager, Paddington.

Mr. G. Matthews, Operating Assistant, Superintendent of the Line's Office, Paddington, to be Divisional Superintendent, Swansea.

Mr. H. J. Peacock, Divisional Superintendent, Worcester, to be Operating Assistant, Superintendent of the Line's Office, Paddington.

Mr. J. E. Potter, Assistant Divisional Superintendent, Paddington, to be Divisional Superintendent, Worcester.

Mr. R. H. B. Nicholls, Assistant Divisional Superintendent, Cardiff, to be Assistant Divisional Superintendent, Paddington.

Mr. H. H. Swift, Chief Clerk, Divisional Superintendent's Office, Chester, to be Assistant Divisional Superintendent, Cardiff.

Mr. N. H. Briant, Junior Assistant to Divisional Superintendent, Newport, to be Chief Clerk, Divisional Superintendent's Office, Chester.

Mr. P. W. Pine, Solicitor's Office, Paddington, to be Common Law and Chancery Assistant, Solicitor's Office, Paddington.

The following further appointments are effective from Monday next, October 18:—

Mr. H. G. Dunsby, Assistant Goods Agent, Paddington, to be Goods Agent, Smithfield.

Mr. R. A. Sims, Chief Clerk, District Goods Manager's Office, London, to be Assistant Goods Agent, Paddington.

L.N.E.R. Appointments

The following appointments are announced:—

Mr. W. H. Hanscombe, Assistant Solicitor (General), to be Chief Assistant Solicitor, in succession to Mr. H. R. Cripps, who, as announced in our issue of September 10, retired on October 1.

Mr. W. R. Mole, Assistant Solicitor (Common Law), to be Assistant Solicitor.

Capt. H. J. Perry, Assistant Marine Superintendent, Southern Scottish Area, to be Marine Superintendent, Southern Scottish Area, in succession to Mr. J. A. Rodger, who recently retired.

Sir Alexander Gibb, G.B.E., C.B., F.R.S., was inducted as President of the Institute of Transport, and delivered his presidential address at the first ordinary meeting of the institute in the 1937-38 session on Monday last, October 11. Sir Alexander, who was born at Broughty Ferry on February 12, 1872, was educated at Rugby School, and University College, London. He comes from a long line of engineers, his father having been head of the firm of Easton Gibb & Son Limited, and his grandfather (a pupil of Thomas Telford), Engineer of the Great North of Scotland Railway and Aberdeen Harbour. His great-grandfather, John Gibb, was closely associated with Thomas Telford in harbour and engineering and bridge building in Scotland, and his great-great-grandfather, William Gibb, constructed portions of the Forth & Clyde Canal, and other public works in Scotland in the second half of the 18th century. It was obvious, therefore, that Sir Alexander was destined for an engineering career, and he became a pupil of Sir John Wolfe Barry, K.C.B., LL.D., F.R.S., and Mr. H. M. Brunel (the last of the Brunels), obtaining experience on the important works of the Tower Bridge, Barry Docks, and other large works. Subsequently, as Assistant Engineer to him, Sir Alexander's services were lent to Mr. Charles Forman, of Formans & McCall, Glasgow, and he was engaged on the Glasgow Central, Lanarkshire & Dumbartonshire, and West Highland Railways. He then acted as Resident Engineer on the Metropolitan Railway widening into London, for the Great Central Railway, and later on the Whitechapel & Bow Railway. Joining his father as Managing Director of Easton Gibb & Son Limited, in 1900, he carried out a number of important bridge and docks works, including Rosyth Naval Base, and eventually became Chairman of that company. At the beginning of the war he joined the Royal Engineers, and was appointed Chief Engineer (Ports Construction) to the British forces in France and Belgium, and also Deputy-Director of Docks. His appointment as Civil Engineer in Chief to the Admiralty followed in 1918, and in 1919 he became Director General of Civil Engineering to the newly formed Ministry of Transport. He was created C.B. (military) in 1918, a Knight Commander of the Order of the British Empire also in 1918, and a Knight Grand Cross of the Order of the British Empire in 1920. Sir Alexander returned to private practice in 1921 as a consulting engineer, and he is still the senior member of Sir Alexander Gibb & Partners. Among the many public offices which he has held, may be mentioned the chairmanship of the Technical Committee on London Traffic (1920-21), and of the Light Railways Investigation Committee during the same period. He was also a member of the Advisory Committee on the Electrification of Railways, and in 1930-31 was Chairman of the Council of the London Chamber of Commerce. He is a fellow of the Royal Society, a fellow of the Royal Society (Edinburgh), a member of the Royal Fine Arts Commission, President of the Institution of Civil Engineers, President of the London Chamber of Commerce, Past-President of the Institution of Chemical Engineers, President of the Institute of Welding, President of the Engineering Section of the British Association, and a member of the Institution of Mechanical Engineers.

Photo] [Speaight

Sir Alexander Gibb, G.B.E., C.B., F.R.S.
Inducted President of the Institute of Transport, 1937–38

We note with regret the recent death of Mr. G. Whiteley, Superintendent of

Motive Power & Car Department, Eastern Lines Canadian Pacific Railway.

Mr. K. W. C. Grand, who, as announced above, has been appointed an Assistant to the General Manager at Paddington, G.W.R., was educated at Rugby, and joined the service of the G.W.R. in 1919 at Park Royal goods station. After gaining experience there, at Ealing Broadway, and in the Divisional Superintendent's Office at Paddington he was transferred in 1922 to the General Manager's Office. In March, 1926, he was appointed General Agent for the U.S.A. and Canada with offices in New York, and on his return to England became, in May, 1929, Assistant Publicity Agent. On the expiration of the company's trade advertising agreement with its contractors, Mr. Grand was appointed Commercial Advertising Agent, in 1930, to organise and control the department newly created to deal with this branch of advertising. In January, 1932, he took over also the charge of the Publicity Department with the title of Commercial Advertising and Publicity Agent. In 1933 Mr. Grand was actively associated with the organisation of the first railway air service, inaugurated by the G.W.R. between Plymouth and Cardiff, and subsequently extended to Birmingham.

Mr. K. W. C. Grand

Who has been appointed an Assistant to the General Manager, Paddington, G.W.R.

Mr. Gilbert Matthews

Appointed Divisional Superintendent, Swansea, G.W.R.

Mr. H. J. Peacock

Appointed Operating Assistant, Office of the Superintendent of the Line, Paddington, G.W.R.

Mr. J. E. Potter

Appointed Divisional Superintendent, Worcester, G.W.R.

He became Commercial Assistant to the Superintendent of the Line in July, 1933, and just over a year later was appointed General Assistant to the Superintendent of the Line. In May, 1936, he became Divisional Superintendent at Swansea, which office he now vacates on his appointment as from Monday last as an Assistant to the General Manager at Paddington.

Mr. Gilbert Matthews, who succeeds Mr. K. W. C. Grand as Divisional Superintendent, Swansea, G.W.R., was educated at Westminster, and entered the company's service in the General Manager's Office in 1908. During 1909-1910 he gained experience in station working in the London Division, and then went to the United States to study traffic operating on the Pennsylvania and New York Central Railroads. On his return to this country he was attached to the passenger train running section of the Office of the Superintendent of the Line until his appointment in 1925 as Chief Clerk, to the Divisional Superintendent, Plymouth. In January, 1932, Mr. Matthews was appointed Assistant to the Superintendent of the Line dealing principally with staff matters, and in July, 1934, he became Operating Assistant to the Superintendent of the Line, from which office he now transfers to Swansea as Divisional Superintendent.

Mr. H. J. Peacock, who, as announced above, has been appointed Operating Assistant, Superintendent of the Line's Office, Paddington, G.W.R. in succession to Mr. Gilbert Matthews, joined the service of the G.W.R. in 1898 in the Divisional Locomotive and Carriage Superintendent's Office at Bristol. After working for a few months there he was transferred to the Traffic Department at Stapleton Road, Bristol, where he gained experience in passenger and parcels work. He joined the staff of the Bristol Divisional Superintendent in 1899 where he remained until his transfer to the Office of the Superintendent of the Line at Paddington in January, 1915. At Paddington Mr. Peacock was associated with freight train operating and in 1923 he became chief of that section of the Superintendent of the Line's Department. In May, 1929, he returned to Bristol as Assistant Divisional Superintendent, and in July, 1933, was appointed Divisional Superintendent at Worcester. He actually took up the last-named appointment on September 19, 1933, and now leaves Worcester on his return to Paddington. On several occasions Mr. Peacock has contributed to the columns of THE RAILWAY GAZETTE.

Mr. J. E. Potter, who succeeds Mr. H. J. Peacock as Divisional Superintendent, Worcester, G.W.R., entered

the company's service in 1901 in the Office of the Superintendent of the Line, and later served at several stations in the London Division until his transfer in 1905 to the Divisional Superintendent's Office at Paddington. From 1909 to January, 1913, he was Stationmaster at Marlborough, but returned on the latter date to the Office of the Superintendent of the Line, and was made a passenger train runner. In 1930 he was appointed Chief Clerk to the Divisional Superintendent at Gloucester. In 1932 he was transferred to a similar position at Plymouth, and was promoted Assistant to the District Traffic Manager at Plymouth in September, 1933. Mr. Potter was appointed Assistant Divisional Superintendent at Paddington in January, 1935, whence he now moves to Worcester as Divisional Superintendent.

Mr. William Whitelaw, Chairman of the London & North Eastern Railway Company, has consented to be the President of the Railway Convalescent Homes for the year 1938.

We regret to have to record the death in Buenos Aires on September 12, at the age of 76 years, of Mr. William Thompson, formerly Traffic Manager and afterwards General Manager of the Entre Rios Railways.

Messrs. Merz & McLellan announce that they have taken into partnership Mr. William Dixon and Mr. Arthur Howell, who have been members of their staff for a number of years. The headquarters of Mr. Dixon and Mr. Howell will be Carliol House, Newcastle-upon-Tyne.

Mr. F. F. Bennett, M.I.Mech.E., former Chief Mechanical Engineer, Buenos Ayres & Pacific Railway, who has been acting for Mr. C. R. Mayo—of the firm of Messrs. Fox & Mayo, Consulting Engineers, London—will, after Mr. Mayo's return from Brazil, be returning to Argentina.

Under the Order in Council dated February 6, 1928, the Lord President of the Council has appointed Mr. G. M. B. Dobson, D.Sc., F.R.S., Lt.-Col. J. H. M. Greenly, C.B.E., and Mr. S. K. Thornley to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research. Professor A. Fowler, C.B.E., D.Sc., Sc.D., F.R.S., F.R.A.S., Sir Clement D. M. Hindley, K.C.I.E., M.Inst.C.E., M.Inst.T., M.I.E.(Ind.), and Mr. T. Franklin Sibly, D.Sc., LL.D, have retired from the council upon the completion of their terms of office.

We regret to record the recent death of Mr. Edmund Deschenes, Vice-President and Manager of the Central Vermont Railway—a subsidiary of the Canadian National Railways—and formerly Assistant to the President of the C.N.R. He was well-known in both Canadian and United States transportation circles, and was a member of the Disbursement Committee of the Railway Accounting Officers' Association and of its Executive Committee.

The New French National Railways Company Board

Members of the board of the French National Railways Company, representing the interests of the existing railway companies in the new administration have now been appointed. The list, approved by M. Queuille, Minister of Public Works, comprises the following 12 members: MM. René Mayer, Pierre Getten and Pierre Thiriez, for the Compagnie du Nord; MM. Louis Marlio and de Tarde, for the Compagnie de l'Est; MM. Félix Frédault and Georges Barrès, for the Compagnie Paris-Orleans; MM. Georges Goy, André Laurent-Atthalin and Marcel Peschaud, for the Compagnie Paris-Lyon-Mediterranée and MM. Tirard, Moreau-Néret, for the Compagnie du Midi. M. Louis Marlio, President of the Compagnie de l'Est, has been appointed Vice-President of the board of the National Railways Company to represent the railway companies.

The Minister of Public Works has also approved the appointment of the following four railwaymen as members of the board of the National Railways Company: MM. Jacquet, Jarrigion, Liaud and Semard. These members were selected by the National Council of the Railwaymen's Federation.

The managing committee (comité de direction) of the National Railways Company comprises the following: MM. Guinand, President; Guimpret and Marlio, Vice-Presidents; MM. Aron, Bouffandeau, Devinat, Rueff, representing the State, and MM. Frédault, Goy, Mayer and Tirard, representing the companies.

Mr. C. H. Eden, Director and Secretary of B.E.N. Patents Limited, and a Director of Broom & Wade Limited, whose death on July 3 last we recorded in our issue of July 9, left estate to the value of £15,661; net £14,270.

It is with regret that we have to announce the death of Sir John Dewrance, G.B.E., the eminent engineer, and sometime Chairman of Babcock & Wilcox Limited. Born in 1858, educated at Charterhouse & King's College, London—of which he was a Fellow—he was awarded the Watt gold medal and Telford premium of the Institution of Civil Engineers; he took out over 100 patents for engineering inventions. Sir John was head of his own firm, Dewrance & Company, engineers, and was appointed Chairman of Babcock & Wilcox Limited in 1899, a post he held until July last, when he retired, but retained his seat on the board. During the war he was a member of the Advisory Committees of the Treasury, the Ministry of Munitions, and Department of Overseas Trade, and was made a K.B.E. in 1920, and G.B.E. eight years later. Sir John was Chairman of the original companies that developed the Kent coalfield, and of Kent Coal Concessions and allied companies; he was High Sheriff of Kent in 1925. From 1920-26 he was President of the Engineering and Allied Employers' National Federation, and in 1923 was President of the Institution of Mechanical Engineers.

At a meeting of the General Managers' Conference, held at the Irish Railway Clearing House, Dublin, on October 12, Mr. S. C. Little, General Manager of the Sligo Leitrim and Northern Counties Railway, was unanimously elected Chairman of the Conference for 1938.

Indian Railway Staff Changes

Mr. A. C. Griffin, O.B.E., and Mr. T. C. Hales, V.D., have been confirmed as Divisional Superintendents (Senior), and Mr. S. E. L. West as Divisional Superintendent (Junior)—though continuing to officiate in a senior post—on the N.W.R.

On return from leave, Mr. V. S. Sundaram resumed charge of his duties as Controller of Railway Accounts on August 20. Mr. H. C. Norbury, who had been officiating as Controller, resumed his duties as Chief Accounts Officer, G.I.P.R., on August 23.

Mr. L. F. Jackson, Senior Government Inspector of Railways, Bombay, has been granted two months' leave preparatory to retirement, as from September 4. The Hon. H. T. de B. Bingham has been appointed to succeed him, with the rank of Chief Engineer, State Railways.

Lord Trenchard, former Commissioner of the Metropolitan Police, is to be appointed a director of the Rhodesia Railways Limited. The appointment, which has been approved by the Governments of Northern Rhodesia, Southern Rhodesia, and Bechuanaland, is to come before the board of the company on October 20. Lord Trenchard, who is 64, is Chairman of the United Africa Company and a Director of the Goodyear Tyre & Rubber Co. (Great Britain) Ltd.

British-owned Argentine Railways Appeal to President.—At the invitation of President Furto, representatives of the British-owned lines were recently interviewed by him, and explained the critical condition of their railways, and the necessity of urgent relief in some form or other. It will be recalled that there have been frequent appeals to the Government for increases in rates, and that the exchange position is still very difficult. A Reuters message of October 6 reports that the railways have addressed a note to Senor Acevedo, Argentine Minister of Finance, requesting his authorisation for an increase in fares.

Engineering Limitations and Transport Ideals

Sir Alexander Gibb's Presidential Address to the Institute of Transport

(*See editorial note on page* 629)

Speed and economy were suggested as the ideals of all transport enterprise by Sir Alexander Gibb in his presidential address to the Institute of Transport on Monday. Safety, he said, he did not mention because he claimed it to be pre-supposed in any engineering scheme; and although "Safety First" was an excellent maxim, it struck him as an uninspiring ideal.

Three major factors were involved in solving transport problems so as to arrive at these ideals of speed and economy. They were: the engineering practicability; the financial aspect; and the human element. Speaking as an engineer, as always and primarily he had been and still remained—and not as a transport expert—he would say that there were few cases in which engineering shortcomings hindered attainment of the ideal. For the most part financial considerations were the limiting factor; and, in a few quite definite directions, it was the human element. He was convinced that engineering capacity would almost always be in advance of what was economically practicable, and of the ability of the human frame to keep pace with invention and development.

The limitation of the human factor was nowhere seen more clearly than in the questions of deep foundations and deep tunnelling. When an underwater tunnel was driven through porous material, the pressure of the air inside the tunnel had to be greater than that of the water above in order to avoid an inrush. The limits to which the human frame could withstand such pressures meant that at depths greater than 120 ft. below water level tunnelling was possible only through impervious material. Such a scheme as a tunnel under the English or Irish Channels, while in his own view perfectly feasible, entailed the great risk that at any moment some large fault under great head of water might present conditions of pressure which would be wholly insoluble.

Similar considerations, by limiting the depth of foundations, had made certain bridge projects impracticable. The foundations of the San Francisco—Oakland Bay bridge had in one instance been taken as deep as 242 ft. below water level, but that was possible only because it had not been necessary to use compressed air. In many conditions of subsoil such a depth would be quite impracticable.

Today, many long tunnels were being built for highway motor traffic, and in these circumstances ventilation was a limiting factor as important as any. It might be necessary for really long tunnels to be restricted to electric traction, and furnished with some sort of moving platform for the conveyance of vehicles having internal combustion engines.

In considering whether bridging or tunnelling was the more economical in certain conditions, the question arose of the practical limit to the span of the modern bridge. The present record was the 4,200-ft. span of the Golden Gate bridge at San Francisco, followed by the 3,500-ft. span of the George Washington bridge, New York. In discussion with the engineers of both bridges, he had been informed that they confidently looked forward to seeing spans of 5,000 to 6,000 ft. within the next decade, and up to 10,000 ft. in their lifetime.

Present materials would allow suspension bridge spans to be extended to 18,000 ft. and even more, although before that limit was reached the ratio of dead load to live load would become economically unjustifiable. Silicon steel or other such alloys would unquestionably permit of greater cantilever spans than the present 1,800-ft. record of the Quebec Harbour bridge. He considered that until much further advance had been made in the preparation of special materials for reinforced concrete, bridges of that material would not greatly exceed 600 ft. in span. Enough had been said, however, to show that so far as bridges were concerned, engineering offered no obstacles to the transport idealist.

Science and engineering had together been most successful in overcoming difficulties of navigation by sea and air at night and in fog, and soon travel in such conditions would be little less sure and speedy than by daylight. It was probably true to assert that the financial losses and dislocation of business caused year after year by fog were in their aggregate more serious than those involved even by the greatest of wars.

Speed of regular transport by air would at no distant time equal or exceed the present records, and the range of aircraft would be so rapidly extended that the provision today of floating bases on long ocean crossings might very shortly prove unnecessary and redundant. It seemed almost inevitable that the human factor, and not a slowing up of engineering or scientific development, would be the weak link in aviation progress.

In shipping, he considered that engineering had not quite kept pace with its progress in other directions; but in no sense had marine engineering reached its limit, and the development of welding would perhaps have a greater influence on this form of enterprise than any other. A year or two ago he might have classed railway with marine engineering as a branch in which progress had been relatively slow; but today such expresses as the Coronation and the Silver Jubilee were providing over distances of a few hundred miles all the speed that even air services could offer in similar conditions.

Perhaps road design was at the moment more to the fore than any other form of transport engineering. This country had a greater road traffic density than any other, but on 41,000 miles of its roads speed was restricted to 30 m.p.h. With this might be contrasted the programme of building 4,400 miles of special motor roads—virtually road railways—in Germany, more than 600 miles of which were already completed. Improvement of the British road system was primarily an economic, not an engineering, problem. Here was yet another sign of in how few respects it was that transport was handicapped by engineering in its development.

Forthcoming Events

Oct. 16 (*Sat.*).—Permanent Way Institution (Manchester–Liverpool), at Temperance Inst., London Street, Southport, 3 p.m. "Creosoting of Timbers," by Mr. R. Chamberlain.

Oct. 19 (*Tues.*).—Federation of Railway Lecture and Debating Societies (N.E. Area), at Co-Operative Hall, Railway Street, York, 7 p.m. "British Railways in Retrospect, 1932–1937," by Dr. K. Fenelon.

Great Eastern Mechanics' Institution, Stratford, 8 p.m. "The Uses of India Rubber in Railway Engineering Work," by Mr. R. Glascodine.

Institute of Transport (London), at Inst. of Electrical Engineers, Savoy Place, W.C.2, 6 p.m. "Transport in France," by Mr. F. Wymer.

London School of Economics, Houghton Street, W.C.2, 5 p.m. "The Geography of British Iron and Steel Production," by Mr. S. Beaver.

Permanent Way Institution (Scottish), at Royal Technical College, George Street, Glasgow, 7.30 p.m. "Permanent Way and Transport Problems," by Mr. F. Lawson.

Oct. 20 (*Wed.*).—Institution of Structural Engineers (Scottish), at 129, Bath Street, Glasgow, 7.15 p.m. "The San Francisco-Oakland Bay Bridge," by Prof. J. Husband.

National Lubricating Oil and Grease Federation, at Grosvenor House, Park Lane, London, W.1. Annual Dinner.

Railway Officers' and Servants' Association, at Trocadero, Piccadilly, London, W.1, 6.30 for 7 p.m. Anniversary Festival.

Oct. 21 (*Thurs.*).—Diesel Engine Users' Association, at Caxton Hall, Caxton Street, London, S.W.1, 5 p.m. "The Design of Elastically-Supported Foundations for Reciprocating Engines," by Mr. R. Klopstock.

Institution of Electrical Engineers, Savoy Place, London, W.C.2, 6 p.m. Inaugural Address by Sir George Lee, O.B.E.

Institution of Locomotive Engineers (Scottish), at Royal Technical College, George Street, Glasgow, 8 p.m. Address by President.

Permanent Way Institution (Nottingham-Derby), at Railway Inst., Derby, 7.15 p.m. "Rail Joints," by Mr. W. White.

Railwey Students' Association, Houghton Street, London, W.C.2, 6 p.m. Presidential Address by the Rt. Hon. Viscount Horne, G.B.E.

Oct. 22 (*Fri.*).—Institution of Railway Signal Engineers, at Criterion Restaurant, Piccadilly, London, W.1. Annual Dinner.

Oct. 22–23.—L.M.S.R. (London) Dramatic Society, at Fortune Theatre, Drury Lane, W.C.2, 8 p.m., "Theatre Royal."

G.W.R. Improvements to Goods Depots

Schemes in progress all over the system involve £750,000

Important schemes of improvements to meet increasing trade and to provide better facilities for traders are now being carried out at many Great Western Railway goods depots throughout the system. In addition, other schemes have been authorised upon which work will be begun at an early date. The schemes, which represent in the aggregate an expenditure in the region of three quarters of a million pounds, when completed will add a further 120,000 sq. ft. to the warehouse accommodation available at goods depots.

The largest scheme is at Hockley station—the company's principal goods depot in Birmingham. This is being entirely remodelled at a cost of over a quarter of a million pounds and considerable progress has already been made with the work. The scheme will include a new and much larger transit shed through which the whole of the inwards and outwards goods traffic will be dealt with.

At Brentford Town depot, the goods yard and shed are being extended, and at the dock depot two large new warehouses, one with several floors, are being built beside the dock. Improved craneage equipment is also being provided to serve the dock. The New Yard goods depot opposite Westbourne Park, Paddington, is being equipped with a large transit shed and overhead warehouse with several floors. The seasonal perishable freight traffic coming in to London will be dealt with at this depot, which will be the West Country "key" to Covent Garden.

Extensive new offices for the staff of nearly 100 are being constructed at Swansea High Street goods station. At Haverfordwest a new goods and passenger station is being built, with the goods accommodation on the opposite side of the line. At Penzance a very extensive goods yard with a large transit shed, offices, and warehouse adjoining have just been completed to take the goods traffic which will be diverted from Penzance station itself to make room for the extension of the passenger station.

Two more floors are being added to the office block above the parcels depot at Paddington, and the London District Goods Manager and his staff will be brought from his present offices in Newgate Street and accommodated in one of these. The top floor will form a commodious dining club for the use of the company's clerical staff at Paddington.

A large 4-floor warehouse in the Plymouth Millbay goods yard has recently been authorised and the work will be begun at an early date. The goods shed and siding facilities at Park Royal are again being extended to meet the increasing requirements of this rapidly developing district. At Greenford, a new goods yard for coal and other traffic is being laid out on the south side of the line, to augment the facilities available in the present goods yard on the other side where the transit shed is also being extended.

To meet the rapidly-increasing developments of the Morris Cowley district the company's goods station is again being extended and new offices are being built for the staff. Progress in the Slough area also, mainly from the Trading Estate, has necessitated a further considerable extension of the goods yard and transit shed, and a new overhead warehouse with two floors is also being built. A 25-ton fixed electric jib crane is being installed in the Langley Green goods yard to deal with the very heavy articles that pass through that station.

At Briton Ferry additional sidings have been laid out to serve the works on the north side of the dock, and these have just been brought into use. Nancegollan station has been remodelled and improved accommodation just brought into use. Improved facilities for dealing with broccoli traffic have also been provided at Gwinear Road.

Since January last, new warehouses have been or are to be provided at Dymock, Stourport-on-Severn, Monmouth, Llanidloes, Chepstow, Truro (Newnham), Witney, Usk, Woodborough, and Shipton-under-Wychwood, and the existing warehouses at Wolverhampton (Herbert Street) extended.

Organisation of French Transport Board

Details of the organisation of the *Conseil Supérieur des Transports* (Supreme Board of Transport) have been fixed by a Decree, published in the *Journal Officiel*; the board comprises 81 members. The various forms of transport are allotted 18 seats. Of these, 8 go to the National Railways Company, 1 to the local railway companies, 5 to road transport firms, 2 to inland navigation, 1 to the coastal shipping, and 1 to air transport interests. In addition, the labour interests concerned are represented by 9 members, comprising 1 for each form of transport, except the National Railways Company, which has 4 members.

Public interests are represented by 27 members. Of these, 6 are allotted to business interests—including 4 for chambers of commerce, 1 for French ports and 1 for trade transport organisations—; 6 represent industry—1 each for mines, metallurgy, mechanical engineering, textiles, chemical industries, and building and public works contractors—; 6 are delegated by agricultural associations; 7 for passengers of all categories, comprising tourists, sports associations, commercial travellers, journalists and war veterans; and 2 for the departmental and municipal administrations. Lastly, 27 members represent the Government administrations. Members of the board are appointed for five years.

The board may delegate certain of its powers to a permanent committee. The General Railway Commission of the Ministry of Public Works is replaced by a General Commission of Railways and Transport, which will deal with questions of rail and road co-ordination, in addition to railway affairs, except questions concerning transport in the Paris district and transport affairs of the colonies and foreign countries. Co-ordination will not be organised exclusively by the board, but in co-operation with technical committees of the departmental councils. The latter will prepare plans for the organisation of rail and road co-ordination, which will be submitted in the first place to the Ministry of Public Works.

The National Council of the Railwaymen's Federation recently discussed the railway reorganisation plans. It was stated that the federation would have 400,000 members after the amalgamation of the railway companies, and a protest was made that the personnel had no representative on the managing committe, only four on the Board of the National Railways Company, and only five on the Supreme Board of Transport. Apart from this, the federation approved the new railway organisation as a marked advance, which opened the way to a real industrial nationalisation of the railways and other means of transport.

In regard to the wages question, the federation emphasised its determination to obtain an immediate readjustment of wages and advances in the various indemnities and allowances for expenses. It associated its claims with those of the public services, demanding as from October 1, 1937, a uniform monthly indemnity of fr. 150.

INCANDESCENT HEAT COMPANY'S EXTENSIONS.—Considerable extensions have been made to the foundries of the Incandescent Heat Co. Ltd., Smethwick, and they are now turning out approximately 50 tons a week of grey-iron castings of high-tensile strength and ranging from a few pounds up to 4 tons in weight. In addition to their own work, they are supplying a large number of castings to the engineering and allied trades. The company is also producing special heat-resisting metal capable of withstanding temperatures up to 1,100° C., without deformation and with absolute resistance to oxidation and sulphur attack.

MINISTRY OF TRANSPORT ACCIDENT REPORT

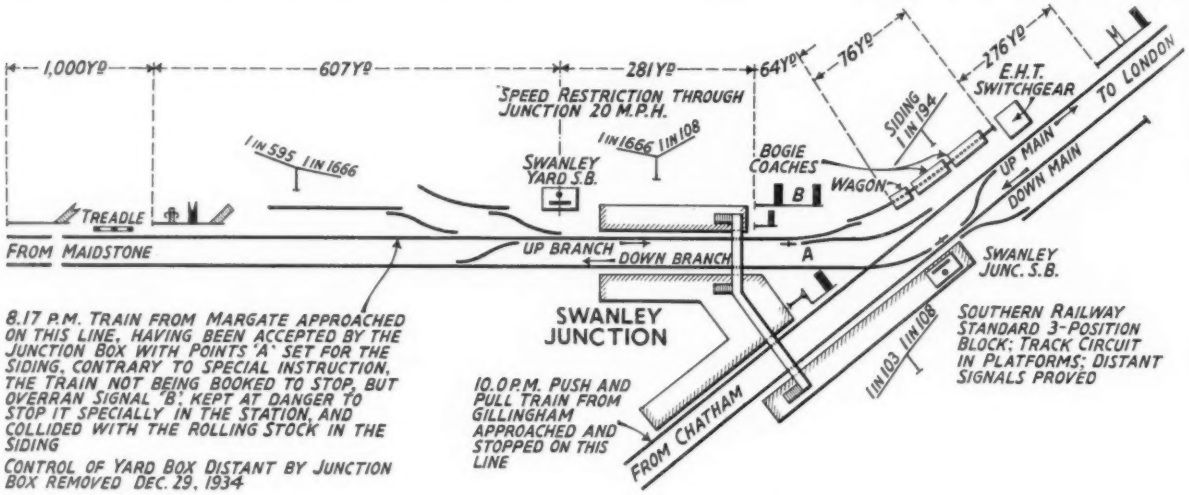
Swanley Junction, S.R., June 27, 1937

At about 11.18 p.m. the 8.17 p.m. steam passenger train, Margate to Victoria via Ashford, composed of 7 bogie coaches containing some 100 passengers and drawn by 4-4-0 engine No. 1768 overran the Junction box up branch home signal—forming the starting signal from the up branch platform—and crashed into a loaded wagon and 2 empty coaches in a siding. Considerable damage was done; 4 passengers were killed and 11 injured, of whom 8 were detained in hospital; 36 others complained of minor injuries and shock, 8 of whom sustained cuts or bruises when subsequently rendering assistance. The driver and fireman had remarkable escapes, but suffered severely from shock. The three leading coaches, built in 1909, had steel underframes, wooden bodies and screw couplings; the last four, built in 1929, had steel underframes, composite hardwood and steel panelled bodies, timber roofs and Buckeye couplers. The bulk of the casualties were in the 4 rear compartments of the first, and four leading compartments of the second coach, where telescoping occurred. The momentum of the collision was absorbed mainly in wrecking the goods wagon, the 2 old coaches—which were telescoped into one—and an electric switching station beyond the siding buffers, which was put out of action, necessitating special working of electric trains for a time afterwards. Lt.-Col. A. H. L. Mount, who conducted the inquiry, considers it a matter for conjecture whether the Buckeye coupler or special shock absorbing buffers would have prevented the telescoping; there was practically no damage to the modern 4-coach set fitted with that coupler. The running lines were not fouled. It was a moonlight night.

There is a speed restriction of 20 m.p.h. through the junction (see diagram). Enginemen and guard estimated their speed at no more than 20-25 m.p.h.; the Junction box signalman suggested it was 50 m.p.h., the yard box signalman thought it was 30-35 m.p.h. A passenger—a frequent traveller by the train—Mr. J. H. McDonnell, supported the last-named estimate, but Col. Mount thinks speed may have been 40 m.p.h., having regard to the extensive damage. Considerable difficulty was experienced in extricating the injured. Mr. McDonnell felt that tools and appliances were not immediately available in sufficient quantity, criticised the absence of expert supervision and referred to the time taken to bring the breakdown gang. There was a certain amount of tool equipment on the train but no emergency tool box at the station and no person qualified in first aid was on duty, though there were 2 first-aid boxes and 2 stretchers there. The stationmaster was not called until 11.40 p.m. Additional tools were obtained, some from the surrounding district, and volunteers came to use them. The confined space made operations difficult, the wrecked vehicles being against the side of a cutting. Great care had to be exercised. Two fire brigades assisted. The first injured person was extricated at 11.50 p.m. Breakdown organisation is primarily intended for clearing the line; to use breakdown cranes to remove wreckage containing imprisoned passengers would generally be undesirable and might lead to further injury.

The approach view of the Yard box up home with Junction distant beneath it was about 600 yd. from the fireman's —on this engine the left—side and about 160 yd. from the driver's side. The view of the Junction home is much limited by a road bridge and footbridge and it has a lower co-acting arm. View from the fireman's side was between 170 and 150 yd., then obscured until 50 yd. The driver could not see it until he was 35 to 40 yd. from it. Signalling was re-arranged in 1934, Yard box home and distant being moved back 440 yd., making 888 yd. from the Junction distant to its home, giving adequate braking distance. Control by the Junction box over the Yard box distant was then abolished. Special instructions provide that only trains booked to stop may be accepted by the Junction box with the facing points set for the siding. Foreman W. T. Langridge, whose evidence was indefinite on some points, said he decided to stop the Margate train to allow passengers on the 10.0 p.m. push-and-pull from Gillingham to Swanley, which was running 25 min. late, to get to Victoria, the last up electric train from Swanley having left at 11.6 p.m., after waiting 7 min. He had authority to act, but it was usual to obtain the Controller's consent; he was unable to do so as the line was engaged. His decision was taken too late to warn the Margate train at Otford, its last stopping station. The Gillingham train arrived at 11.15 p.m. and Langridge was accompanying the passengers over the bridge when the accident happened, the Margate train travelling, he thought, about 30 m.p.h. He heard no whistle. Asking the fireman why they did not stop he received the reply "I told the driver the distant signal was on, but he did not take any notice of me."

The evidence of Signalman Anthony, Yard box, was also indefinite as to times of telephone conversations. It appears he was advised about 11.6 p.m. by Signalman Reeves at the Junction box, who had been instructed by Langridge, that the Margate train was to be stopped. He called up Otford and heard it was about to leave Kemsing (the station before), but whether this really was after he knew of the decision



Track and signal diagram, showing circumstances of Swanley accident

the evidence is too vague to establish. Otford was not told of it, however, whatever the reason; Anthony had been at Swanley Yard three months. It was his first experience of a special stop. When he offered the Margate train it was accepted. No suggestion was made that he should check it; he cleared his home and distant signals. He thought Reeves had set the road for the ¼ mile overrun and that the Junction distant warned the driver to stop, but when the train passed at 30-35 m.p.h. he thought Reeves must have changed his mind and pulled off that signal. The latter, 21 years at Swanley, made a straightforward, accurate statement. He judged it to be after the Sevenoaks train left that Langridge instructed him; he believed Anthony was on the telephone then but called him and told him of the arrangement. He accepted the Margate train on the assumption that Anthony would check it; he admittedly infringed the special instruction and agreed that Anthony would probably assume the ¼ mile clearance on the main line existed, as that accorded with custom and he had never infringed the instruction before. It was the first time he had to deal with a through train being stopped out of course. Guard W. A. Godwin observed the Yard distant at "clear" and then the Junction distant at "caution"; he thought the train was under proper control and speed at the latter signal 25 m.p.h. He was unable to see the Junction home, but was prepared for a stop at it, but as the brake was not applied thought it must have been cleared; had he known a special stop was to have been made he would have taken action. Fireman A. Morgan confirmed this evidence as to signal indications and speed. He shouted to the driver—it was his first trip with him—that the Junction distant was "on," but did not know if he had observed it himself. Speed was not excessive. Apparently both men realised the situation when about 80 yd. from the obstruction.

Driver H. J. Aplin said he knew the road well, but it was 6 months since he worked a train from Otford not stopping at Swanley. His statements to the company's officers and to Col. Mount were contradictory. He judged speed was 25 m.p.h. after the Yard distant; he missed the Junction distant and must have looked for it too late but acted as if it were off. He was not expecting to find the signal at the end of the platform "on" and maintained that in such an event he would have had the Yard box distant against him and been checked at its home. He did not hear Morgan's shout owing to steam blowing off. The curve was not so sharp as to render the signal difficult to see, and it was unnecessary to cross the footplate to do it.

Chief Inspecting Officer's Conclusion and Recommendations

While this was a case of failure to observe signals, the fundamental cause was the omission of precautions, usually taken against a driver's fallibility. It is difficult to say what Aplin really thought regarding the signal indications. He said he did not see the Junction box distant; he admittedly did not act as if it were "on," and was disregarding the speed restriction as well. His lapse was serious and cannot be excused, but it was not safeguarded, as it should normally have been, by checking him at the Yard box (cf. the warning acceptance at other places, or the application of Rule 39a), or by advising him that the train was to make a special stop at the station, which would have amounted to the same thing. He is 55 years of age, with an excellent character, and a good driving record for 16 years. No blame attaches to Fireman A. Morgan.

Guard W. A. Godwin apparently first thought the train was under control, and then, having regard to the continuance of its speed, that the Junction home was clear. In view of the serious disregard of the speed restriction, he ought to have realised the situation earlier. He should have applied the brake as a precaution, to draw Aplin's attention. Had he known that a stop was to be made, he would obviously have taken action earlier.

The jury's first rider to its verdict on July 1 was:—"*That proper instructions on any alterations of train service should be forwarded to the driver and guard at least to the previous stopping station, and further if possible.*"

This recommendation has been discussed with the company's officers, who point out that it is the usual practice to give trainmen prior advice of special stops, but that there are occasions when, owing to the exigencies of traffic working, this is not possible. On this occasion traffic was heavy; trains were running late and out of course; but even though the Sevenoaks train was the last scheduled connection to carry forward passengers from the Gillingham train, no steps were taken, until the latter was due, to ascertain its position.

No valid reason could be found why much earlier inquiries should not have been initiated by Foreman Langridge; his decision to send forward the Sevenoaks train and stop the Margate train, though correct, was taken unnecessarily late and thus the trainmen were not informed of the special stop.

An emergency stop for traffic purposes has no relation to the emergency stop which would, for instance, be necessitated if a train were running away on the up main line, when the Junction signalman might be forced to repeat what happened on this occasion. Although Foreman Langridge was in a situation of some difficulty, was pressed for time, and experienced delays in telephone communication, he cannot but be held to have unwittingly contributed to this unfortunate occurrence, even though merely to a minor extent, in not having initiated his inquiries earlier.

The major operating mistake, however, was Signalman B. Reeves' acceptance of the Margate train contrary to the special instruction, which admits of a modified clearance only for trains *booked* to stop. He is a man of 55, with an excellent record, and has served in his present capacity at Swanley for 21 years. He frankly admitted his error, an oversight in haste to prevent further delays.

Had he correctly refused the train Signalman Anthony would have checked or stopped it at the Yard home signal, the Yard distant having remained at "caution." The train would then have been allowed to draw into the station; operation would have corresponded with Rule 39a, the object of the special instruction being to produce the same effect, so far as block working is concerned, as if all signalling functions were concentrated in the Junction box. Signalman Anthony can hardly be criticised, but, as he knew the stop had to be made, it is surprising he did not think it desirable and prudent to keep his distant signal at "caution"; clearing it could have had no value, for the train had to stop.

The jury's second rider was "*That attention be drawn to the signalling on the up road on the Maidstone Branch Line.*"

This no doubt resulted from Driver Aplin's evidence and Col. Mount discussed it with the company's officers, but provided there is adherence to the speed restriction and to the special operating instruction, he sees no reason for modifying the signalling arrangements which were inspected and approved so recently as 1935. He suggests, however, that the general question of the operation of this junction and of making special traffic arrangements, particularly in ensuring last train connections being made at night, merits further consideration. There is, for instance, the point whether it is desirable to leave the Yard distant clear when the Yard box is switched out.

With regard to the emergency arrangements, accounts indicated that everything reasonably possible was done with the tools available, pending the arrival of the fire brigades. Work of this kind has received much consideration: large numbers of railwaymen are qualified to give first-aid, &c., while most passenger trains carry emergency equipment, which is also distributed at many stations and signal boxes. Two features of this case, of general application, should be considered, with a view to improvement in organisation or equipment:—

(*a*) The adequacy of telephone circuits, and the desirability of being able to initiate priority calls; three attempts were made to communicate with the Controller about the Margate train, without success. There also appears to have been delay in requisitioning the breakdown trains, due to telephone lines being engaged; the Controller did not hear of the accident till 11.30 p.m., Stewarts Lane and Bricklayers' Arms depots were not advised till 11.43 p.m. and 11.50 p.m.

(*b*) Emergency tools are kept at about 100 different places throughout this system, but not at this heavily used junction. The usual tool boxes are also carried with other emergency appliances in many passenger trains; but there was only one on the Margate train, as one has not been provided in all the older 3-coach sets. Though it is not clear that the complaint of shortage of tools was fully justified, there appears no doubt that tools from outside sources were at first welcome, indicating that the train equipment was, in fact, insufficient; in all the circumstances it would seem desirable to review the number of sets of emergency tools which are distributed at stations throughout the system and are now carried on passenger trains, of whatever character. Emergency equipment should also be easily available and its location known to the staff.

G.W.R. Ambulance Work, 1936-37

The year ending June 30, 1937, was a record one for the G.W.R. Ambulance Centre in regard to the number of successful examination students. The report of ambulance work for the year shows that the number of passes by members of the staff was 7,783, which represents an increase of 263 over the previous year. A particularly encouraging feature of the year's work has been the influx of recruits to the movement, 808 members having obtained the first year certificate, 61 more than in the previous twelve months. The Athlone Bowl, awarded to the division producing the highest number of recruits in proportion to the total number of staff employed, has been gained for the second time by the Exeter Division, with the satisfactory percentage of 2·29, the runners-up being the Bristol B. Division with a percentage of 1·80.

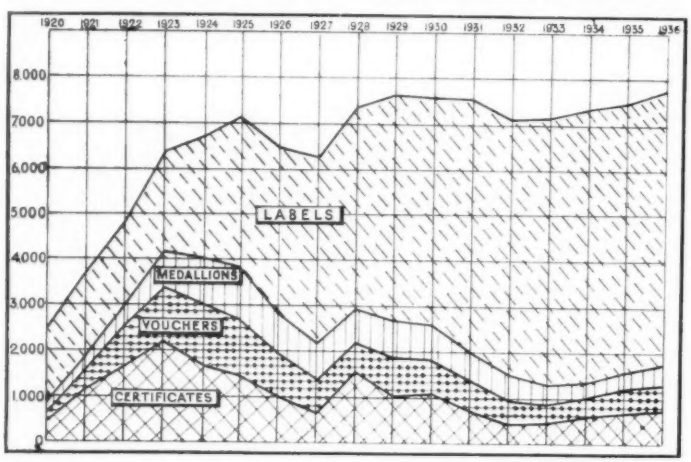


Chart showing progress of G.W.R. ambulance movement since the year 1920

A good entry was again received in the company's annual series of competitions, 266 teams participating, 111 in Class 1 (Advanced) and 155 in Class 2 (Beginners), and a number of fresh teams came to the front and won successes in the field. The competitions were followed in most cases by presentation functions presided over by the company's officers, when the divisional trophies, and prizes awarded by the directors, were distributed to the winning teams. The Final Ambulance competition, in which the eight teams selected from the preliminary contests met, took place at Paddington station on April 6, when the Directors' Shield, the premier trophy of the line, was won by the Cheltenham team, and the Carvell Cup (for runners-up) by Newport, High Street. Sir Robert (now Lord) Horne, Chairman of the company and President of the G.W.R. Ambulance Centre, presided at the subsequent function and presented the trophies and prizes. The trophies included the Henry Butt Challenge Bowl, which was won by the Aberdare team for obtaining highest place among beginners' teams in the company's competitions. At the Inter-railway competition held at the Wharncliffe Rooms, London, on April 22, the Cheltenham and Newport, High Street teams represented the G.W.R. The Welsh Inter-railway competition took place at Cardiff on December 1, 1936, when three teams from the G.W.R. and three from the L.M.S.R. contested possession of the Harry Webb Cup and for the first time for some years this was won by the L.M.S.R., the G.W.R. Fishguard Harbour (holders) and Aberdare teams obtaining second and third places.

Three further trophies have been presented to the Centre during the year for the encouragement of ambulance work. Mr. R. W. Higgins, Divisional Superintendent, Exeter, has given a silver Cup with the object of increasing membership in his division, and Mr. A. W. H. Christison, Locomotive Superintendent, Newton Abbot, has presented a new cup for beginners' competition teams in the Plymouth and Exeter Divisions. The Swindon Division has received from an anonymous donor a competition trophy for advanced teams, to be known as the "Coronation Cup."

As is always the case, a large number of reports of actual first aid rendered in cases of personal injuries were received during the year, many of which were supported by medical testimony as to the excellence of the treatment. These were adjudicated on their merits by the company's Chief Medical Officer, and gold, silver, and bronze medals and framed certificates awarded, the presentations being made by the Chairman of the company.

The long service medals awarded continue to be a strong incentive to the maintenance of ambulance efficiency, and during the year no fewer than 365 members of the staff qualified for the company's 15 year efficiency medal, while 193 bars (20 years' efficiency), 92 quarter century medals, and 29 and 17 bars for 30 and 35 years' efficiency respectively have been issued. The total number of these awards now held by the company's employees is:—

15 year gold medals	...	...	2,607
20 ,, ,, bars	...	...	1,195
25 ,, ,, medals	...	...	514
30 ,, ,, bars	...	...	129
35 ,, ,, bars	...	...	25

The annual Gold Medallists' outing took place at Swansea on June 5, when 260 medallists from all parts of the system, with their wives, were afforded a civic reception by the Mayor of Swansea and entertained to luncheon by the company.

The excellent results achieved are largely due to the good work and enthusiasm of the respective divisional secretaries, class secretaries, instructors and others, many of whom have been connected with the movement for a long period of years. In recognition of such services, and on the recommendation of the Central Ambulance Committee, 30 members of the staff have been admitted to the Order of St. John of Jerusalem in the grade of Serving Brother, one has been promoted as Officer (Brother), and the Vellum Vote of Thanks of the Order has been awarded in six other cases.

No report of the year's ambulance progress would be complete without a note of appreciation of the encouragement given by the officers of the company, and of the medical men in all parts of the line who have acted so readily as lecturers, adjudicators and examiners to the company's first aid classes.

NOTES AND NEWS

Glencoe-Volksrust Electrification Opened.—Messages from Cape Town report that on October 4 the Natal main line electrification extension from Glencoe to Volksrust on the Natal-Transvaal was inaugurated.

Retired Railway Officers' Society.—The autumn luncheon will be held on Tuesday, November 9, at the Charing Cross Hotel, Strand, W.C.2, and Sir Josiah Stamp, G.C.B., G.B.E., has consented to attend as the chief guest. The proceedings will begin at about 12.45 and terminate about 2.30 p.m.

New Halt for Four Oaks.—The G.W.R. announces that a new halt at Four Oaks between Newent and Dymock on the Gloucester-Ledbury line will be opened tomorrow, October 16. All trains between Gloucester and Ledbury will call at the halt and cheap bookings will be given to places in the surrounding districts.

Head-On Collision in U.S.A.—Five persons lost their lives as a result of a head-on collision between a passenger train and a shunting engine at Alliance, Nebraska, on October 7. The drivers and firemen of both engines were killed instantly and a fifth railway employee died from injuries. Three passengers were taken to hospital but the rest escaped with, at most, minor injuries.

An effective coloured display card exhibited in the cars of the L.P.T.B. railways

Manchester Model Railway Society.—The annual exhibition of this Society is to be held in the Albert Hall, Peter Street, Manchester, from December 15 to 18 inclusive.

Northern Counties Committee (L.M.S.R.).—Traffic receipts of the Northern Counties Committee for the first 39 weeks of the current year amount to £308,189, an increase of £3,515 or 1·15 per cent.

Train Arrival Indicator at York.—The L.N.E.R. proposes to erect a train arrival board at York station in a prominent position in the main circulating area. The board and surrounds will be so designed that information for the benefit of the public will be clearly displayed. Gill Sans lettering will be adopted and the board will be floodlit.

Swiss Loan to French Railways.—Negotiations between the French National Railways Company and a group of Swiss banks with a view to a loan for the French railway systems has resulted in an agreement for a loan of 200,000,000 Swiss francs (£9,500,000). The issue price, Reuters understands, will be 99, and the rate of interest 4 per cent., the loan to be redeemable in two years.

Agreed Charges.—Fifty-three more applications for the approval of agreed charges have been lodged with the Railway Rates Tribunal, as will be seen from the legal notice published on page 662. A copy of each application (1s. post free) may be obtained from Mr. G. Cole Deacon, Secretary, Rates and Charges Committee, 35, Parliament Street, S.W.1. Notices of objection must be filed on or before November 2, 1937.

Increased Wages for American Train Crews.—A Reuters telegram from Chicago states that a member of the National Mediation Board has announced the signing of an agreement between the companies and their employees granting train operating staff a 44-cent daily increase in wages. This agreement, which affects 86 railways, is said to involve the additional sum of £7,000,000 annually in operating costs.

London School of Economics Lectures on Railway and Cognate Sessions.—Courses of lectures on railway and cognate subjects will be held at the London School of Economics, London University, during the 1937-38 session for students taking the degrees of B.Sc. (Econ.), with honours in Transport and International Trade; and B.Com., with honours in Trade and Transport. These courses are specially arranged for railway students, and three of them are recognised by the L.N.E.R. for participants in the company's education scheme. Particulars of the lectures, fees, and of medals and prizes awarded for essays or distinction in certain subjects, are given in a booklet received from the school, of which the address is Houghton Street, Aldwych, London, W.C.2.

Additional Standard Timings in Belgium.—The Belgian winter timetables show an extension of the hourly standardised services (which already existed between Brussels and Antwerp, Ostend, Charleroi, and Liége), to two further lines—Brussels to Mons, with intermediate stoppages at Braine-le-Comte and Soignies; and Brussels to Namur, stopping at Ottignies and Gembloux. In both instances, these trains are supplementary to the services previously existing, and in neither case are they *bloc* trains.

The Paris Exhibition.—The closing date of the Paris International Exhibition has been fixed for November 25. Subject to its normal validity, the *Carte de Légitimation* issued in connection therewith will therefore cease to be valid after December 10 (15 days after the closing date). These cards and the tickets at 50 per cent. reduction issued on their production can be obtained for the outward journey to Paris up to and including November 25, and tickets for the homeward journey available for departure from France not later than December 10.

Ransome & Marles Bearing Co. Ltd.—At the annual general meeting of Ransome & Marles Bearing Co. Ltd., the Chairman (Mr. V. S. Woods) said that the increase in sales in this country had been well distributed. The company's export trade had held its own despite the closing of certain markets, and trade in the Dominions had again shown a very satisfactory increase and had more than compensated for reductions in other directions. The current year had begun with a record volume of orders on hand, and some of the delivery instructions extended well into the year 1939.

Cordoba Central Railway.—Since the Cordoba Central Railway Company has as yet no information regarding the intentions of the Argentine Government beyond the end of September, and pending consideration of the purchase of the railway, the company has now been obliged to reimpose the wage deductions in accordance with the terms of the Presidential award of 1934. The deductions had previously been withdrawn on the Government undertaking until the end of September to reimburse the company for the amount involved. Strike action is possible in consequence of the re-imposition of the deductions.

"Railway Developments."—At a meeting of the Railway Club, held on October 7, Mr. W. A. Willox, Associate Editor of THE RAILWAY GAZETTE, gave an address on "Railway Developments," referring to speed as the main trend today. This trend had produced streamlining which had a certain publicity value. Mr. Willox described improvements in maintenance with modern

running-shed equipment; lubrication at high temperatures; compressed-air braking; colour-light signalling, and train control. Particular mention was made of numerous developments in permanent way, including improved alignment and the use of flat-bottomed rails. Structural developments were dealt with, and finally reference was made to the co-ordination of rail, road, and air traffic. Mr. Willox closed on an optimistic note for the future of railways. The address was illustrated by a series of lantern slides.

The B.S.I. Handbook and Annual Report, 1936-7.—The British Standards Institution has issued its half-yearly handbook which includes the annual report, 1936-7, and indexed lists of British Standard Specifications to July, 1937. The usual sections showing the current lists of British Standard Specifications, the new and revised specifications recently issued and those in course of preparation are followed by a complete subject index. A further section is devoted to an index of the methods of tests contained in the various British Standards. Copies of the new handbook (under reference CE. 4300) are available from the British Standards Institution, Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 4d. post free.

Road Accidents.—The Ministry of Transport return for September of persons killed or injured in road accidents is as below. The figures in brackets are the fatalities for the corresponding period of last year :—

	Killed	Injured Serious	Injured Slight
England—			
Pedestrians ...	194 (208)	1,074	4,212
Others... ...	312 (293)	2,985	10,209
Wales—			
Pedestrians ...	6 (8)	61	168
Others... ...	7 (8)	145	335
Scotland—			
Pedestrians ...	32 (24)	189	514
Others... ...	32 (26)	310	732
	583 (567)	4,764	16,170

The total fatalities for the preceding month were 612, compared with 605 in the corresponding period of 1936.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 40th Week 1937	1936	Inc. or Dec.	Totals to Date 1937	1936	Inc. or Dec.
L.M.S.R. (6,870¼ mls.)	£	£	£	£	£	£
Passenger-train traffic...	507,000	481,000	+ 26,000	21,374,000	20,562,000	+ 812,000
Merchandise, &c. ...	549,000	530,000	+ 19,000	19,585,000	19,024,000	+ 561,000
Coal and coke ...	261,000	249,000	+ 12,000	10,091,000	9,515,000	+ 576,000
Goods-train traffic ...	810,000	779,000	+ 31,000	29,676,000	28,539,000	+1,137,000
Total receipts	1,317,000	1,260,000	+ 57,000	51,050,000	49,101,000	+1,949,000
L.N.E.R. (6,315 mls.)						
Passenger-train traffic...	328,000	309,000	+ 19,000	13,987,000	13,379,000	+ 608,000
Merchandise, &c. ...	356,000	347,000	+ 9,000	13,422,000	12,949,000	+ 473,000
Coal and coke ...	254,000	243,000	+ 11,000	9,813,000	9,202,000	+ 611,000
Goods-train traffic ...	610,000	590,000	+ 20,000	23,235,000	22,151,000	+1,084,000
Total receipts	938,000	899,000	+ 39,000	37,222,000	35,530,000	+1,692,000
G.W.R. (3,738½ mls.)						
Passenger-train traffic...	197,000	191,000	+ 6,000	9,009,000	8,753,000	+ 256,000
Merchandise, &c. ...	219,000	208,000	+ 11,000	7,971,000	7,644,000	+ 327,000
Coal and coke ...	109,000	102,000	+ 7,000	4,429,000	3,968,000	+ 461,000
Goods-train traffic ...	328,000	310,000	+ 18,000	12,400,000	11,612,000	+ 788,000
Total receipts	525,000	501,000	+ 24,000	21,409,000	20,365,000	+1,044,000
S.R. (2,157 mls.)						
Passenger-train traffic...	295,000	282,000	+ 13,000	13,408,000	12,739,000	+ 669,000
Merchandise, &c. ...	67,000	65,500	+ 1,500	2,478,500	2,534,000	− 55,500
Coal and coke ...	29,000	28,500	+ 500	1,186,500	1,213,000	− 26,500
Goods-train traffic ...	96,000	94,000	+ 2,000	3,665,000	3,747,000	− 82,000
Total receipts	391,000	376,000	+ 15,000	17,073,000	16,486,000	+ 587,000
Liverpool Overhead ... (6½ mls.)	1,289	1,183	+ 106	52,273	47,933	+ 4,340
Mersey (4½ mls.) ...	4,490	4,450	+ 40	167,232	162,082	+ 5,150
*London Passenger Transport Board ...	574,600	564,100	+ 10,500	8,399,000	8,367,000	+ 32,000
IRELAND						
†Belfast & C.D. pass. (80 mls.)	1,805	1,909	− 104	108,879	110,359	− 1,480
,, ,, goods	489	495	− 6	19,150	21,648	− 2,498
,, ,, total	2,294	2,404	− 110	128,029	132,007	− 3,978
Great Northern pass. (543 mls.)	10,200	10,250	− 50	461,150	449,600	+ 11,550
,, ,, goods	8,850	9,550	− 700	375,900	390,450	− 14,550
,, ,, total	19,050	19,800	− 750	837,050	840,050	− 3,000
Great Southern pass. (2,076 mls.)	33,496	34,640	− 1,144	1,514,782	1,503,061	+ 11,721
,, ,, goods	47,750	48,983	− 1,233	1,636,177	1,667,872	− 31,695
,, ,, total	81,246	83,623	− 2,377	3,150,959	3,170,933	− 19,974

* 15th week (before pooling) † 41st week

British and Irish Railway Stocks and Shares

Stocks	Highest 1936	Lowest 1936	Prices Oct. 13, 1937	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	61¼	45½	63½	−2
5% Con. Prefce. ...	126½	116¾	116½	—
5% Red.Pref.(1950)	113	108½	110½	—
4% Deb.	119½	110½	106½	+½
4½% Deb.... ...	121	114	111	—
4½% Deb.... ...	129	121	116½	—
5% Deb.	141	134	128½	—
2½% Deb.... ...	79⅛	74	69½	—
5% Rt. Charge ...	136½	130	127½	—
5% Cons. Guar. ...	135¼	127¾	124	—
L.M.S.R.				
Ord.	35⅝	17	31½	−½
4% Prefce. (1923)	83	52½	74	−1½
4% Prefce. ...	92¾	81	83½	−½
5% Red.Pref.(1955)	109¼	103¼	106	—
4% Deb.	111¾	105 9/16	102½	—
5% Red.Deb.(1952)	119⅝	115½	112½	—
4% Guar. ...	106¾	101⅝	100	—
L.N.E.R.				
5% Pref. Ord. ...	14	9	9½	−½
Def. Ord.	7¼	4¾	4¾	−¼
4% First Prefce.	79¼	55¼	71	−1
4% Second Prefce.	31⅞	18¼	28	−1½
5% Red.Pref.(1955)	100½	77¾	98	—
4% First Guar. ...	104½	98¾	95½	−½
4% Second Guar.	99	90	89	−1
3% Deb.	85¾	79	77	+½
4% Deb.	109¾	104½	101½	+½
5% Red.Deb.(1947)	116¼	110½	108½	—
4½% Sinking Fund Red. Deb.	111½	107½	108	—
SOUTHERN				
Pref. Ord.... ...	98¾	82½	89½	—
Def. Ord.	27⅝	20⅛	20¾	−¾
5% Pref.	120¾	118½	113½	—
5% Red.Pref.(1964)	119¾	115¼	113½	—
5% Guar. Prefce.	136	129½	124	−1
5% Red.Guar.Pref. (1957)	120	115¾	114	—
4% Deb.	117 3/16	109½	105½	+½
5% Deb.	140	134	126½	—
4% Red. Deb. 1962–67	116½	110	106½	—
BELFAST & C.D.				
Ord.	9	4½	4½	+½
FORTH BRIDGE				
4% Deb.	107	105	101½	—
4% Guar. ...	107 5/16	104	100½	—
G. NORTHERN (IRELAND)				
Ord.	19½	9¾	6¾	−⅛
G. SOUTHERN (IRELAND)				
Ord.	63	41	32¼	—
Prefce.	65	46	40	—
Guar.	97¼	81	73¼	+¼
Deb.	99¾	83¼	91	+1¼
L.P.T.B.				
4½% "A" ...	127¾	121	113½	—
5% "A" ...	138¼	133½	124½	−1
4½% "T.F.A." ...	111½	108½	105	—
5% "B" ...	131¾	123¾	117½	—
"C"	112½	93	81½	+6
MERSEY				
Ord.	40¾	23	25½	−2
4% Perp. Deb. ...	103	98	97	—
3% Perp. Deb. ...	78	74⅝	74½	—
3% Perp. Prefce.	68⅞	63¼	66½	—

CONTRACTS AND TENDERS

The Economical Boiler Washing Co. Ltd. has received a contract from the L.N.E.R. for a hot-water boiler washing plant to be installed at King's Cross locomotive depot.

H. Lees & Co. Ltd. has received a contract from the L.N.E.R. for a 250-ton coaling plant to be installed at Darlington locomotive depot.

Hurst, Nelson & Co. Ltd. has received an order from the Sudan Railways for three bogie benzine tank wagons.

The board of the Latvian Railways, states Reuters, has ordered 20 locomotives from Henschel & Sohn, of Kassel. Three hundred wagons will shortly be ordered from various works. The works at the port of Liepaja have recently built ten new cold-store wagons and an order for twelve double-decked cattle wagons has also been given to the S.A. Vairogs.

The Egyptian State Railways Administration has recently placed the following orders :

The North British Locomotive Co. Ltd., Cylinders. (Ref. No. E.S.R. 21,663. Total cost £235. Delivery Glasgow.)

Fried. Krupp, Springs. (Ref. No. E.S.R. 21,671. Total cost £341. Delivery Rotterdam and Antwerp.)

The General Electric Co. Ltd., Dial switches. (Ref. No. E.S.R. 34.84. Total cost £202. Delivery London.)

H. J. Skelton & Company, on behalf of the Royal Hungarian Iron, Steel & Machine Works, Locomotive, carriage and wagon tyres. (Ref. No. E.S.R. 321.G3/6. Total cost £7,454. Delivery f.o.b. Trieste.)

The Ateliers de Construction de Familleureux, Belgium, has received through its agent, C. M. Hill & Co., an order from the South African Railways & Harbours Board for 20 underframes, complete with bogies for refrigerator wagons, 3 ft. 6 in. gauge. The approximate value of this order is £14,000.

J. Baker & Bessemer Limited has received an order from the Central Argentine Railway for 440 locomotive tyres.

Thos. A Edison Limited has received an order from the South Indian Railway Administration to the inspection of Messrs. Robert White & Partners for 114 alkaline cells for train lighting.

Nasmyth, Wilson & Co. Ltd. has received an order from the Bengal North Western Railway, to the inspection of Messrs. Rendel, Palmer & Tritton, for one pair of locomotive cylinders, required for a P class metre-gauge 4-6-0 tank locomotive.

Leyland Motors Limited has received the following orders from railway-associated road transport operators :—

Crosville Motor Services Limited, six oil-engined Titans.

East Midland Motor Services Limited, three oil-engined Titans and eleven oil-engined Tigers.

Lincolnshire Road Car Co. Ltd., nine oil-engined Tigers.

Wilts & Dorset Motor Services Limited, two oil-engined Lions.

The United Steel Companies (India) Ltd. has received orders from the Indian Stores Department for 380 tons of square steel billets.

The Hunslet Engine Co. Ltd. has received an order from the Crown Agents for the Colonies for one locomotive boiler for the British Honduras Railway.

Alexander Findlay & Co. Ltd., has received an order from the Junagad State Railway Administration to the inspection of Messrs. Robert White & Partners for 21 20-ft. span girders, comprising approximately 72½ tons of steelwork.

The Crown Agents for the Colonies have recently placed the following orders :—

British Thomson-Houston Co. Ltd., Alternator set.
W. T. Henley's Telegraph Works Co. Ltd., Armoured cable.
Turners Asbestos Cement Company, Asbestos pipes.
Stewarts and Lloyds Limited, Bitumen-lined pipes, boiler tubes and galvanised piping.
Babcock & Wilcox Limited, Boiler plant.
Tubes Limited, Boiler tubes.
C. Richards & Sons Limited, Bolts.
T. Bolton & Sons Limited, Bronze and copper wire.
Callender's Cable & Construction Co. Ltd., Cable.
British Insulated Cables Limited, Cable.
T. Firth & J. Brown Limited, Locomotive, carriage and wagon tyres.
Steel, Peech & Tozer Limited, Carriage and wagon tyres.
Stanton Ironworks Co. Ltd., Cast-iron pipes.
Wolverhampton Corrugated Iron Co. Ltd., Corrugated iron, galvanised and steel sheets.
Guest, Keen & Nettlefolds Limited, Clip bolts, dogspikes and rail clips.
Whitecross Co. Ltd., Copper, galvanised and bronze wire.
I.C.I. Metals Limited, Copper ingots.
Eyre Smelting Co. Ltd., Copper and white metal ingots.
E. & E. Kaye Limited, Copper wire.
Stothert & Pitt Limited, Cranes.
Rushton & Hornsby Limited, Generating set and oil engine.
Bellis & Morcom Limited, Generating set.
Doulton & Co. Ltd., Insulators.
Mitchell Engineering Co. Ltd., Locomotive coaling plant.
S. Fox & Co. Ltd., Locomotive tyres.
P. & W. Maclellan Limited, Mild-steel plates and angles.
A. Herbert Limited, Milling machine.
Leyland Motors Limited, Mobile laboratory.
Whitehead Iron & Steel Co. Ltd., Mild-steel bars.
Dorman, Long & Co. Ltd., Mild-steel plates and steel troughings.
Torbay Paint Co. Ltd., Paint.
R. Kearsley & Co. Ltd., Paint.
Phosphor Bronze Co. Ltd., Phosphor bronze.
British Electric Transformer Co. Ltd., Power station transformers.
The United Steel Cos. Ltd., Rails and fish-plates.
Appleby-Frodingham Steel Co. Ltd., Rolled steel joists.
Muir Machine Tools Limited, Slotting machine.
Stanton Ironworks Co. Ltd., Spun iron pipes.
Brush Electric Engineering Co. Ltd., Static transformers.
F. Braby & Co. Ltd., Steel sheets.
Herbertson & Co. Ltd., Steelwork.
R. White & Sons, Switches and crossings.
Siemens Bros. & Co. Ltd., Telegraph ironwork.
General Electric Co. Ltd., Telephone apparatus and materials.
Steel Co. of Scotland Ltd., Tyres.
W. & T. Avery Limited, Weighbridge.

John Walsh & Co. (Birmingham) Ltd. has received an order from the South Indian Railway Administration to the inspection of Messrs. Robt. White & Partners for 588 steel panel sheets for coaches.

Imperial Chemical Industries (India) Limited has received an order from the Indian Stores Department for a quantity of fog signals.

Guest Keen & Nettlefolds Limited has received an order from the Argentine North Eastern Railway for 20,000 fish-bolts, nuts and washers.

Tenders are invited by the Acting Superintendent of Stores, South Indian Railway, Negapatam, receivable by November 22, for the supply of the following :—

About 800,000 lb. mineral axle oil, 90,000 lb. mineral cylinder oil, and 210,000 lb. mineral superheater cylinder oil.

Tenders are invited by the Bengal & North Western Railway, Gorakhpur, receivable by November 1, for the construction in India and delivery as soon as possible (the date to be specified in tender) of 400 metre-gauge covered four-wheeled goods wagons type I.R.C.A. M.A.I., 18 ft., without wheels and axles, but with springs, axleboxes, brasses, screw coupling buffers, and vacuum piped.

It is announced that the adjudication on the tenders received for the supply of two 0-6-0 type diesel-electric shunting locomotives (Ref. No. 1.13/22) has been cancelled.

A. C. Wickman Limited.—We are advised by A. C. Wickman Limited, machine tool manufacturers, that the firm's Manchester office address is now Century House, St. Peter's Square, Manchester, 2. The telephone number is Central 1096.

John Holroyd & Co. Ltd.—We are informed by John Holroyd & Co. Ltd., manufacturers of machine tools, &c., that the firm's London office address is now, 3, Central Buildings, Westminster, S.W.1. The telephone number is Whitehall 3715.

Use of Structural Steel in Building.—British Standard Specification No. 449 for the use of structural steel in building has recently been revised. The principal modifications, compared with the previous issue (1935) are that the definitions have been recast and where possible co-ordinated with corresponding statutory definitions ; the clause about concentrated loading has been incorporated in the major clause on loading and reworded so as to clarify its meaning ; the clause concerning filler floor beams has been amplified to include an alternative method of calculation by means of a simple formula ; and references to the appropriate B.S.S. for welding have been included. Copies may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

LEGAL AND OFFICIAL NOTICES

In the Court of the Railway Rates Tribunal.

Road and Rail Traffic Act, 1933

Agreed Charges

NOTICE IS HEREBY GIVEN that Applications for the approval of Agreed Charges under the provisions of Section 37 of the Road and Rail Traffic Act, 1933, short particulars of which are set out in the Schedule hereto, have been lodged with the Railway Rates Tribunal.

The Procedure to be followed in regard to the inspection of the said Applications and the filing of Notices of Objections is that published in the *London Gazette* of 28th July, 1936.

Printed copies of the Procedure can be obtained from the Railway Rates Tribunal, Bush House, Aldwych, London, W.C.2.

Notices of Objection to any of the said Applications must be filed on or before the 2nd November, 1937.

A copy of each Application can be obtained from Mr. G. Cole Deacon, Secretary, Rates and Charges Committee, 35, Parliament Street, Westminster, London, S.W.1, price 1s. post free.

T. J. D. ATKINSON,
Registrar.

8th October, 1937.

Number of Application	Name of Trader and General Description of Traffic
1937—No. 534	PANNETT & NEDEN, 206-208, Stewarts Road, London, S.W.8; Bulbs, Seeds, Toilet Sundries, etc.
1937—No. 535	T. ROBERTS & SONS LTD., Portland Shoe Works, Leicester: Boots and Shoes.
1937—No. 536	SKINETOLIN CO. LTD., 13, Kirkwood Place, London, N.W.1; Drugs, etc. *Applicable also to traffic consigned by one Associated or Subsidiary Company.*
1937—No. 537	STAR SHIRT (1926) CO. LTD., 31, 33 and 39, Sefton Street, Liverpool; Cotton and Linen Goods.
1937—No. 539	ARIEL MOTORS LIMITED, Ariel Works, Selly Oak, Birmingham; Motor Bicycles.
1937—No. 541	ALGRAPHY LIMITED, Willowbrook Grove, Old Kent Road, Peckham, London, S.E.15; Printing Plates, Lithographic Printing Accessories, etc.
1937—No. 542	AMBROSIA LIMITED, Brighton Chambers, Denman Street, London, S.E.1; Butter, etc.
1937—No. 543	BLACK BOY CHOCOLATE CO. LTD., Farleigh Road, Stoke Newington, London, N.16; Confectionery, etc. *Applicable also to traffic consigned by one Associated or Subsidiary Company.*
1937—No. 544	H. J. HEINZ CO. LTD., Harlesden, London, N.W.10; Groceries, Preserves and Provisions.
1937—No. 545	O. & M. KLEEMAN LIMITED, 46, 47, 48 and 49, Redcross Street, London, E.C.1; Fancy Goods, Toys, Earthenware, etc.
1937—No. 546	M. K. ELECTRIC LIMITED, Wakefield Street, Edmonton, London, N.18; Electrical Accessories.
1937—No. 547	PILSNER URQUELL CO. LTD., 77-79, St. Thomas Street, London, S.E.1; Beer, Carbonic Acid Gas, etc.
1937—No. 548	THOMAS & EVANS LIMITED, Porth, South Wales; Provender.
1937—No. 549	BRITISH HORTICULTURAL CO. LTD., Walton, Peterborough; Bulbs, Plants, etc. *Applicable also to traffic consigned by two Associated or Subsidiary Companies.*
1937—No. 550	THE CHISWICK PRODUCTS LIMITED, Burlington Lane, Chiswick, London, W.4; Paints, Polishing Materials, Machinery, Tinplates, Furniture, etc. *Applicable also to traffic consigned by two Associated or Subsidiary Companies.*
1937—No. 551	DYSON & HORSFALL LIMITED, Aqueduct Mills, Preston; Clothing, Drapery, etc.
1937—No. 552	CHARLES EVESON LIMITED, Vicarage Road, Lye, near Stourbridge; Aluminium Ware and Holloware. *Applicable also to traffic consigned by one Associated or Subsidiary Company.*
1937—No. 553	GUARANTEED TOOLS LIMITED, 12/13, Chiswell Street, Finsbury, London, E.C.1; Carpenter's Tools.
1937—No. 554	McCLURE, YOUNG & CO. LTD., 90, Standard Road, Park Royal, London, N.W.10; Chemicals, etc.
1937—No. 555	R. SOMMERVILLE & CO. LTD., Creech Paper Mills, near Taunton; Paper.
1937—No. 556	TAYLOR, LAW & CO. LTD., Tala Works, Adams Street, Birmingham, 7; Tinware and Hardware.
1937—No. 557	HOWARD WALL LIMITED, 25-37, Hackney Road, London, E.2; Hardware, Hair Waving Machines, Cotton and Linen Goods, etc.
1937—No. 558	NEWTON, CHAMBERS & CO. LTD., Thorncliffe, near Sheffield; "Izal" Toilet Rolls.
1937—No. 559	H. K. ELECTRIC LIMITED, Wakefield Street, Edmonton, London, N.18; Electrical Accessories.
1937—No. 560	W. TARBUTT & SONS, 17-29, Tabard Street, Borough, London, S.E.1; Bedspreads, Carpets, etc.
1937—No. 561	UNITED PHOSPHATE & MALT CO. LTD., Chase Road, London, N.W.10; Bakers' and Confectioners' Sundries.
1937—No. 562	EUGENE LIMITED, Edgware Road, Hendon, London, N.W.9; Papier Sachets and small parts of Hair Waving Machines.
1937—No. 563	JOHN HEEMSKERK, 7, Rashleigh House, Thanet Street, London, W.C.; Bulbs, Plants, etc.
1937—No. 564	R. J. & A. R. PITCHERS LIMITED, Rock Place, Godalming; Woollen Goods.
1937—No. 565	T. ROBERTS & SONS LTD., Portland Shoe Works, Leicester; Boots, Shoes, etc.
1937—No. 566	LUKE TURNER & CO. LTD., Deacon Street, Leicester; Elastic Webbing.
1937—No. 567	UNITED DAIRIES LIMITED, 31, St. Petersburgh Place, London, W.C.2; Butter, Cheese, Cream, Eggs, etc. *Applicable also to traffic consigned by seven Associated or Subsidiary Companies.*
1937—No. 568	VITACREAM LIMITED, 48, Mark Lane, London, E.C.3; Butter Flavour, Vitacream, etc.
1937—No. 569	A. P. BISHOP, Haverfordwest; Rabbits (dead).
1937—No. 570	THE FLEETWAY MANUFACTURING CO. LTD., Winton House, St. Andrew Street, London, E.C.4; Domestic Woodware, etc.
1937—No. 571	THE INVERESK PAPER CO. LTD., Inveresk Mills, Musselburgh, Scotland; Paper, etc.
1937—No. 572	VICTORIA MARGARINE WORKS LIMITED, 93 and 94, Farnham Road, Trading Estate, Slough, Bucks; Margarine.
1937—No. 573	PIRIE APPLETON & CO. LTD., Aldgate House, 46-58, Mansell Street, London, E.1; Paper, etc., ex Bucksburn.
1937—No. 574	SCROGGIE BROS., 4, North Road, London, N.7; Groceries, Preserves, Provisions, etc.
1937—No. 575	STERLINGS LIMITED, Pudsey; Boots and Shoes.
1937—No. 576	ELLIOTTS OF NEWBURY LIMITED, Albert Works, Newbury; Chairs.
1937—No. 577	J. SALMON LIMITED, 102 and 104, London Road, Sevenoaks; Printed Matter.
1937—No. 578	HORNE BROS. LTD., 90 and 92, Oxford Street, London, W.1; Boots, Clothing, etc.
1937—No. 579	THE SOUTH WESTERN DAIRIES LIMITED, Sherborne, Dorset; Butter, Cheese, etc.
1937—No. 580	STAR MANUFACTURING COMPANY, Cubitt Town, London, E.14; Perambulators, Invalid Chairs, Nursery Furniture, Toys, etc.
1937—No. 581	FLEMING REID & CO. LTD., Greenock; Returned Empties.
1937—No. 582	COOPER & SONS (SHEFFIELD) LTD., Lockfast Works, Hermitage Street, Sheffield, 2; Hardware. *Applicable also to traffic consigned by one Associated or Subsidiary Company.*
1937—No. 583	R. LEHMANN & CO. LTD., Peninsular House, Monument Street, London, E.C.3; Condensed Milk, Preserves, Provisions, etc.
1937—No. 584	NATIONAL ADHESIVES LIMITED, Slough, Bucks; Pastes, Gums, etc.
1937—No. 585	THE TAUNTON CIDER CO. LTD., Norton Fitzwarren, Somerset; Cider.
1937—No. 586	THE TAUNTON CIDER CO. LTD., Norton Fitzwarren, Somerset; Returned Empties.
1937—No. 587	WELCH, MARGETSON & CO. LTD., 16, Moor Lane, London, E.C.2; Textiles, etc.
1937—No. 588	EXCEL CO. LTD., 50 and 52, St. John Street, West Smithfield, London, E.C.1; Cooked Meats, etc.

Rio Tinto Co. Ltd.

NOTICE IS HEREBY GIVEN that the Share Transfer Books of the Company will be closed from Monday, the 18th, to Saturday, the 30th October, both days inclusive, for the preparation of the Half-yearly Dividend on the Preference Shares, which will be paid on the 1st November.

Holders of Share Warrants to Bearer are informed that they will receive payment of the said Half-yearly Dividend on the Preference Shares at the rate of Two Shillings and Sixpence per Share, less Income Tax, on and after Monday, the 1st November, 1937, on presentation of Preference Share Coupon No. 87, either at the Company's Office in London, or at the Société Générale, 29, Boulevard Haussmann, Paris.

Coupons for payment in London must be left four clear days previously for examination, and may be deposited on and after 20th inst.

By Order,
R. H. BEECHER,
Secretary.

Offices of the Company:
11, Old Jewry,
London, E.C.2.
11th October, 1937.

Legal and Official Notices—(*continued*)

Crown Agents for the Colonies

COLONIAL GOVERNMENT APPOINTMENTS.

APPLICATIONS from qualified candidates are invited for the following posts:—

M/5504. ASSISTANT MECHANICAL OFFICER required for the Nigerian Government Railway for two tours each of 12-24 months, with probability of further employment. Salary £475 a year rising to £840 a year. Free passages and quarters and liberal leave on full salary. Candidates, aged 28-35, must be Associate Members of either the Institution of Mechanical Engineers or the Institution of Locomotive Engineers. They must have served a full apprenticeship with a British Railway or Locomotive firm and subsequently have had at least five years' experience in a Railway Motive Power Department; and possess a sound knowledge of District organisation and administration, together with experience of Running Shed organisation and the supervision of Footplate and Running Shed Staff.

M/5440. CHIEF DRAUGHTSMAN required by the Government of Nigeria for the Mechanical Engineering Department of the Government Railway for two tours each of 12-24 months, with probability of further employment. Salary £400 a year rising to £810 a year. Free passages and quarters and liberal leave on full salary. Candidates, aged 30-35, must be Associate Members of the Institution of Mechanical Engineers or possess an equivalent qualification. They must have served a full apprenticeship with a British Railway or Locomotive firm, and have had subsequent experience in designing or drawing offices; and be capable of setting out the design of a locomotive with approximate weights, a valve gear balancing, and all other detail work connected with locomotive design. Some experience in the design of coaches and wagons is an advantage.

Apply at once by letter, stating age, whether married or single, and full particulars of qualifications and experience, and mentioning this paper, to the CROWN AGENTS FOR THE COLONIES, 4, Millbank, London, S.W.1, quoting the reference number against the appointment for which application is made.

South Indian Railway Company Limited

THE Directors are prepared to receive Tenders for the supply of:—

COPPER RODS AND TUBES AND BRASS RODS.

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders addressed to the Chairman and Directors of the South Indian Railway Company Limited, marked "Tender for Copper Rods, &c.," with the name of the firm tendering, must be left with the undersigned not later than 10 a.m. on Friday, the 5th November, 1937.

The Directors do not bind themselves to accept the lowest or any Tender.

A charge, which will not be returned, will be made of 5s. for each copy of the Specification.

E. A. S. BELL,
Managing Director.

91, Petty France,
Westminster, S.W.1
13th October, 1937.

RAILWAY AND OTHER REPORTS

Madras & Southern Mahratta Railway.—The directors have decided to recommend, at the next general meeting of stockholders to be held on Wednesday, December 15, a dividend for the half-year ending December 31, 1937, payable January 1, 1938, of 4½ per cent., which will make, with the dividend of 4 per cent. paid in July last, a total of 8½ per cent. for the year, as against 8 per cent. paid last year.

South Indian Railway.—The directors have decided to recommend that a final dividend for the year 1937 of ¾ per cent., less income tax, be paid from surplus profits on January 1, 1938, making with the guaranteed interest of 1¾ per cent. payable on the same date, a total payment of 2½ per cent., less income tax, for the half-year ending December 31, 1937, and together with the payment that was made on July 1, 1937 (namely, 2¼ per cent.), a total payment of 4¾ per cent. for the year.

London Transport C Stock.—The London Passenger Transport Board announces that a final payment of interest on London Transport "C" stock for the year ended June 30, 1937, will be made by the board's registrars, the Bank of England, on October 30, 1937, to all holders of London Transport "C" stock registered or inscribed in the books of the Bank of England at the close of business on October 11, at the rate of 2¾ per cent., less income tax at 5s. in the £, making, with the interim payment of 1½ per cent., a total of 4¼ per cent. for the year. The sum of £28,061 remaining after the payment of this interest, being less than one-eighth of 1 per cent. on the London Transport "C" stock outstanding, has in accordance with section 39 (7) (ii) of the London Passenger Transport Act, 1933, been transferred to the London Transport "C" stock interest fund. The board also announces that, in compliance with Sections 47 and 48 (3) of the London Passenger Transport Act, 1933, as amended by Section 87 of the London Passenger Transport Act, 1936, it will shortly transmit to the Minister of Transport the report and copies of the statement of accounts and statistics and of the auditors' report for the year ended June 30, 1937, and that copies of the documents will be on sale on October 28, 1937.

Darjeeling Himalayan Railway.—Net revenue for the year to March 31 last amounted to Rs. 3,35,035, comparing with Rs. 3,37,506 for the previous year, and the amount brought in was Rs. 1,66,359. The preference dividend again takes Rs. 2,18,750 and the 4 per cent. ordinary dividend again takes Rs. 70,000. The sum of Rs. 50,000 is placed, as before, to contingent reserve, leaving Rs. 1,62,644 to be carried forward.

Barranquilla Railway & Pier Co. Ltd.—The London accounts for the year to June 30 last show that £12,162 was received from the Colombian Government for interest on the purchase money for the railway and other properties, and that £2,463 was received from interest on investments, &c., making a total of £14,625. After allowing for London expenditure and other adjustments, there is a balance of £4,727, out of which a dividend of 1 per cent. (requiring £4,500) has been paid, leaving £227 to be carried forward. In March last a resolution to reduce the capital from £656,250 to £600,000 was confirmed by the Court.

George Turton, Platts & Co. Ltd.—The net profit for the year ended July 31 is £48,642, compared with £32,321 for the previous year. The directors recommend a final dividend of 10 per cent. and a bonus of 5 per cent., making 20 per cent. for the year. For 1935-36 the final dividend was 7½ per cent., with a bonus of 2½ per cent., making 15 per cent. for the year. It is proposed to add £10,000 to reserve, £10,000 to dividend equalisation fund, and £2,500 to the employees' superannuation fund, and to carry forward £21,282, against £17,426 brought in. The report states that a record amount of work was turned out during the year under review, and that the current year has started with more orders than ever.

Northern General Transport Co. Ltd.—The interim dividend is 4 per cent., the same as a year ago.

Skefko Ball Bearing Co. Ltd.—An interim dividend of 10 per cent., tax free, is announced, payable November 5. A similar payment was made a year ago.

Tecalemit Limited.—The directors recommend a dividend of 16 per cent., less tax, for the year to July 31 last. For the previous year the dividend was 12 per cent., less tax.

Bengal Dooars Railway.—The directors recommend the payment of a final dividend of 3½ per cent. on the ordinary stock, subject to income tax, making a total distribution of 6 per cent. for the year ended March 31, 1937.

Netherlands Railways Receipts.—The revenue of the Netherlands Railways for the first six months of 1937 was 47,037,528 fl., compared with 45,906,328 fl. in the corresponding period of 1936.

Central Argentine Railway.—The directors announce a balance dividend of 2¼ per cent. on the 4½ per cent. preference stock, making 4½ per cent. for the year ended June 30, 1937; and dividends of 6 per cent. for the year ended June 30, 1933, and June 30, 1934, on the 6 per cent. preference stock, making 12 per cent. in all.

Forthcoming Meetings

Oct. 27 (*Wed.*).—**Buenos Ayres Great Southern Railway Co. Ltd.** (Annual General), River Plate House, Finsbury Circus, E.C.2, at noon.

Nov. 3 (*Wed.*).—**Buenos Ayres Western Railway Limited** (Annual General), River Plate House, Finsbury Circus, E.C.2, at noon.

Railway Share Market

All sections of the stock and share market were subjected to heavy liquidation earlier in the week, sentiment again being dominated largely by the absence of more hopeful developments in the international situation. Subsequently the lower prices brought in buyers, but share values generally show a sharp decline on balance.

Owing to the market trend the junior stocks of the Home railways have moved against holders. The past week's traffics, which were awaited with a good deal of interest as an indication of the influence of the higher railway rates, were viewed in the market as somewhat disappointing, for although quite favourable increases were again shown and there is no evidence that the higher rates are leading to diversion of traffic to the road, a larger increase in receipts had been estimated by some market men. L.M.S.R. ordinary showed partial recovery to 31½, the £57,000 traffic gain for the past week creating an excellent impression and tending to provide confirmation of the view that the railway will probably benefit most from the higher transport rates. It is now being suggested that earnings on the ordinary stock may work out at around 2¾ per cent. for the year. The 4 per cent. preference and 4 per cent. 1923 preference stocks at 83½ and 74 respectively were lower on the week, but the reduced prices subsequently attracted attention. Great Western ordinary came in for a good deal of selling earlier in the week when markets were very reactionary, but there was partial recovery to 64 following publication of the traffic gain of £24,000. In this case earnings on the stock for 1937 were placed as high as 5½ per cent. in some quarters. L.N.E.R. second preference was lower at 28, although the traffic increase of £39,000 was regarded as good. Southern deferred was rather dull at 21, a larger traffic gain than £15,000 having been expected. London Transport "C" kept most of the improvement which followed declaration of the higher dividend. Considerable interest will attach to the accounts.

Argentine railway stocks subsequently participated in the better trend of markets, although the preference stocks of the B.A. Gt. Southern and B.A. Western were rather out of favour. Central Argentine preference stocks were somewhat better, pending the dividend announcement. The accounts of the railways for the past year are awaited with interest as it is assumed they will show that profits are being dealt with conservatively.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1936-37	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1936	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1936	Prices: Lowest 1936	Prices: Oct. 13, 1937	Yield % (See Note)
South & Central America	Antofagasta (Chili) & Bolivia	834	10.10.37	£ 13,570	— £ 2,600	41	£ 674,310	£ 556,980	+ £ 117,330	Ord. Stk.	25	15¼	17	Nil
	Argentine North Eastern ..	753	9.10.37	11,228	+ 1,528	15	156,968	140,127	+ 16,841	,,	12	2	8½	Nil
	Argentine Transandine ..	—	—	—	—	—	—	—	—	A. Deb.	54	45	85	4 11/16
	Bolivar	174	Sept., 1937	3,750	— 1,450	39	49,350	57,700	— 8,350	6 p.c. Deb.	9	5	8½	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	16	11½	14½	3 7/16
	Buenos Ayres & Pacific ..	2,806	9.10.37	83,127	+ 3,421	15	1,167,681	1,099,575	+ 68,106	Ord. Stk.	17½	6	9	Nil
	Buenos Ayres Central ..	190	25.9.37	$132,700	— $18,400	13	$1,855,600	$1,653,500	+ $202,100	Mt. Deb.	31½	11	31	Nil
	Buenos Ayres Gt. Southern	5,084	9.10.37	123,883	+ 7,648	15	1,758,685	1,617,137	+ 141,548	Ord. Stk.	31¾	13¾	20½	Nil
	Buenos Ayres Western ..	1,930	9.10.37	46,898	+ 5,722	15	673,326	581,760	+ 91,566	,,	29¾	11	17½	Nil
	Central Argentine	3,700	9.10.37	127,854	— 29,024	15	1,970,364	2,043,131	— 72,767	,,	32 9/32	8¾	18	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	21	4½	10½	Nil
	Cent. Uruguay of M. Video	980	2.10.37	15,611	— 464	14	208,926	207,445	+ 1,481	Ord. Stk.	7¾	3	5	Nil
	Cordoba Central	1,218	9.10.37	28,470	+ 1,410	15	521,610	511,020	+ 10,590	Ord. Inc.	5	1	3¼	Nil
	Costa Rica	188	Aug., 1937	24,617	+ 7,487	9	49,305	38,568	+ 10,737	Stk.	36½	32	34	5 7/8
	Dorada	70	Sept., 1937	17,200	+ 2,800	39	139,600	126,600	+ 13,000	1 Mt. Db.	107	101½	104½	5¾
	Entre Rios	810	9.10.37	14,498	+ 1,763	15	210,748	185,767	+ 24,981	Ord. Stk.	17	6	10½	Nil
	Great Western of Brazil ..	1,092	9.10.37	9,300	+ 600	41	295,300	300,500	— 5,200	Ord. Sh.	1/2	5/16	3/8	Nil
	International of Cl. Amer...	794	Aug., 1937	$412,515	+ $95,199	35	$4,038,361	$3,624,520	+ $413,841	—	—	—	—	—
	Interoceanic of Mexico ..	—	—	—	—	—	—	—	—	1st Pref.	1/2	-/6	1/2	Nil
	La Guaira & Caracas ..	22¾	Sept., 1937	4,465	+ 115	39	47,665	41,545	+ 6,120	Stk.	9	3	7½	Nil
	Leopoldina	1,918	9.10.37	24,171	+ 2,646	41	952,340	775,163	+ 177,177	Ord. Stk.	10½	3½	5½	Nil
	Mexican	483	7.10.37	$292,300	+ $2,900	40	$4,328,300	$3,626,200	+ $702,100	,,	1¼	1/4	1/2	Nil
	Midland of Uruguay ..	319	Aug., 1937	7,032	— 939	9	14,578	15,754	— 1,176	,,	1½	1/8	1/2	Nil
	Nitrate	384	30.9.37	4,373	+ 1,518	39	118,014	93,600	+ 24,414	Ord. Sh.	63/6	41/9	21/8	Nil
	Paraguay Central	274	9.10.37	$3,274,000	+ $355,000	15	$48,435,000	$39,369,000	+ $9,066,000	Pr. Li. Stk.	85	71	81½	7 3/8
	Peruvian Corporation ..	1,059	Sept., 1937	89,953	+ 4,468	13	263,674	257,046	+ 6,628	Pref.	15	9	7½	Nil
	Salvador	100	2.10.37	¢15,900	+ ¢3,000	14	¢164,184	¢148,527	+ ¢15,657	Pr. Li. Db.	18	16	22½	Nil
	San Paulo	153½	3.10.37	$4,490	+ $7,165	40	1,323,357	1,182,310	+ 141,047	Ord. Stk.	86	46½	79½§	6 5/16
	Taltal	160	Sept., 1937	2,575	— 30	13	10,070	8,755	+ 1,315	Ord. Sh.	11 5/32	14/—	7/8	11 5/8
	United of Havana	1,353	2.10.37	14,693	— 324	14	242,462	216,842	+ 25,620	Ord. Stk.	3¼	1	2	Nil
	Uruguay Northern	73	Aug., 1937	794	+ 7	9	1,560	1,692	— 132	Deb. Stk.	5	3	6	Nil
Canada	Canadian National ..	23,766	30.9.37	1,175,476	— 7,791	39	29,215,059	26,889,662	+ 2,325,397	—	—	—	—	—
	Canadian Northern ..	—	—	—	—	—	—	—	—4 p.c.	Perp. Dbs.	76	51	67½	5 15/16
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	104¾	99¾	100½	4
	Canadian Pacific	17,228	7.10.37	675,200	+ 37,400	40	21,695,600	20,626,600	+ 1,069,000	Ord. Stk.	16¾	10 15/16	8½	Nil
India†	Assam Bengal	1,329	20.9.37	36,405	+ 3,465	24	615,606	572,503	+ 43,103	Ord. Stk.	87¾	82¼	77½	3 7/8
	Barsi Light	202	20.9.37	2,482	+ 397	24	62,610	58,027	+ 4,583	Ord. Sh.	77½	65½	46	10 7/8
	Bengal & North Western ..	2,111	20.9.37	59,688	+ 5,325	24	1,375,498	1,259,734	+ 115,744	Ord. Stk.	319	292 5/8	308	5 5/16
	Bengal Dooars & Extension	161	20.9.37	5,423	+ 1,768	24	66,241	59,812	+ 6,429	,,	127½	118	86½	6 3/8
	Bengal-Nagpur	3,268	20.9.37	168,975	+ 27,938	24	3,243,639	2,839,135	+ 404,504	,,	104	100¼	90½	4 7/16
	Bombay, Baroda & Cl. India	3,072	30.9.37	226,350	+ 9,150	26	4,366,650	4,049,700	+ 316,950	,,	114	110½	111½	5½
	Madras & Southern Mahratta	3,229	20.9.37	136,275	+ 5,117	24	2,636,077	2,601,741	+ 34,336	,,	116½	108½	108½	7 3/8
	Rohilkund & Kumaon ..	546	20.9.37	10,554	+ 426	24	260,658	248,785	+ 11,873	,,	311	286	310	5 5/16
	South Indian	2,531¾	20.9.37	116,761	+ 9,603	24	1,981,990	1,913,433	+ 68,557	,,	107½	102 5/16	101½	5 7/16
Various	Beira-Umtali	204	July, 1937	97,402	+ 29,426	43	774,298	645,518	+ 128,780	—	—	—	—	—
	Egyptian Delta	620	20.9.37	7,295	+ 172	24	111,490	102,452	+ 9,038	Prf. Sh.	2¼	1 5/8	1¼	Nil
	Great Southern of Spain ..	—	—	—	—	—	—	—	—	Inc. Deb.	1½	1/8	3½	Nil
	Kenya & Uganda	1,625	Aug., 1937	198,117	+ 31,586	35	1,922,899	1,783,395	+ 139,504	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	50½	37	46	7 5/8
	Midland of W. Australia ..	277	Aug., 1937	12,678	+ 1,026	9	22,923	21,865	+ 1,058	Inc. Deb.	97	93½	95	4 5/16
	Nigerian	1,900	28.8.37	33,928	+ 13,074	22	1,046,747	611,547	+ 435,200	—	—	—	—	—
	Rhodesia	2,451	July, 1937	412,400	+ 109,751	43	3,764,458	2,887,519	+ 876,939	—	—	—	—	—
	South Africa	13,263	18.9.37	662,543	+ 46,604	25	15,542,128	14,598,566	+ 943,562	—	—	—	—	—
	Victoria	4,774	May, 1937	822,932	+ 43,220	48	9,342,068	8,986,232	+ 355,836	—	—	—	—	—
	Zafra & Huelva	112	Aug., 1937	11,812	+ 10,374	35	101,758	59,281	+ 42,477	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16.

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements are based on the current rates of exchange and not on the par value.

Electric Railway Traction

The Wirral Electrification

INTERESTING particulars about the electrification of the Wirral section of the L.M.S.R. were given to the recent International Railway Congress Association meeting in Paris by Mr. C. E. Fairburn, Deputy Chief Mechanical Engineer and Electrical Engineer. It will be recalled that the Wirral lines are to be supplied with energy from the Liverpool Corporation system at 11 kV. 3-phase 50 cycles, the feeder cables being carried through the Mersey Railway's tunnel beneath the river under a wayleave agreement. The lines that are being electrified on the 650-volt d.c. system aggregate 10·5 route or 24 track miles, and the estimated yearly energy consumption is 6,000,000 kWh., of which about 5,800,000 kWh. will be for traction purposes. The ratio of the average load to the maximum half-hourly load (2,750 kW. estimated) will be about 1:4, and the annual average power factor will be 0·9 to 0·95 lag. The 11 kV. transmission lines have a length of 12 miles, partly cable and partly overhead, and the estimated transmission losses are approximately 2·5 per cent. of the energy transmitted. Current will be converted in six rectifier substations, one of which is controlled manually and the other five remotely. Each substation will contain a 600 kW. glass-bulb rectifier unit with an overload capacity of 25 per cent. for two hours and 200 per cent. for 10 sec. These rectifiers are to have a 12-phase connection, but no smoothing equipment is contemplated. The conductor rails will be of the flat-bottom type, weighing 105 lb. a yd., as used on the Liverpool-Southport and London electrified systems of the L.M.S.R. All rails and tracks will be cross-bonded every 1,320 ft., and the conductor rails will be paralleled at the terminals through isolating switches. A total of 19 three-car non-articulated electric train sets are being built to carry the traffic and they will be of all-steel construction built up by an extensive use of welding on the principle of integral body and underframing. Each rake will comprise a third class motor-coach with two motor bogies, a first and third class composite trailer, and a third class driving trailer, and multiple-unit operation will be possible.

High-Speed Multiple-Unit Trains

THE three-car articulated trains just being put into service on the 15 kV. single-phase lines of the Swiss Federal Railways add yet another example to the growing list of semi-streamlined set trains used for fast services on main lines. The practice more or less originated about three years ago on the Bavarian electrified division of the German State Railway with two-car sets having a top service speed of 75 m.p.h., and the introduction of these units was followed by that of two-car sets with a maximum designed speed of 100 m.p.h., and more recently three-car rakes having the same output—1,410 kW.—as the first two-car trains. Two-car sets, based in general mechanical portion design on the earlier diesel-electric sets, were introduced by the Netherlands Railways in 1934, and an extension to cover the hauling of a trailer is being adopted for the main lines now being electrified. Fastest of all these trains in normal daily service are the three-car sets of the Italian State Railways, fully described in the issues of this Supplement for July 23 and August 20. The Japanese Government Railways are using a few four-car sets for fast interurban services on the 3 ft. 6 in. gauge lines between Osaka and Kobe; the carrying capacity is about 500 passengers and the maximum designed speed 75 m.p.h. The immediate predecessors of the new Swiss trains were the stainless steel three-car sets of the French State Railways (see our issue of August 20). All these trains are of all-steel welded construction, and all have a high power output per unit of weight—14 to 21 h.p. per ton of tare on the one-hour rating.

The first of the new high-speed electric trains of the Swiss Federal Railways (*see back page*)

THE COMPOUND MOTOR FOR URBAN REGENERATIVE TRAINS

By E. H. CROFT, A.M.Inst.C.E., A.M.I.E.E.

UP to the present time regeneration has been confined mainly to locomotives operating over sections with long gradients. The primary object has been the maintenance of a safe speed on down grades. The retardation of the train has been mainly a matter of secondary importance. The method adopted almost universally for locomotives has been that of exciting the series fields of the motors by a low-voltage exciter during the regenerative period, and the desired stability has been obtained by using various forms of stabilising resistances. The motors operate during motoring as normal series motors.

Of recent years regeneration has been used to a limited degree for the retardation of vehicles on urban services so that kinetic energy created by acceleration may be returned to the line during retardation. A number of systems are used, but few have progressed very far, except the compound motor in certain fields of traction. For urban trains any regenerative system must be suitable for multiple-unit operation. The characteristics demanded by the service, and the extent to which the ideal is met by the compound motor are considered below.

Theoretical Characteristics

The energy stored in a moving train is:—

$$0.5 \frac{1.1W}{G} V^2$$

where W is the weight of the train in lb.
V is the speed in ft. per sec.
G is the gravitational constant.

It is assumed also that the rotating parts are equivalent to a 10 per cent. increase of normal mass. No matter how the train be stopped the above energy has to be absorbed. This energy may also be expressed as $F \times D$ where F is the retarding force, and D the distance in feet travelled by the train during the retardation period. It must be realised that a portion of the retarding force F is supplied by track, air resistance, and motor friction. This is assumed as having a value of 15 lb. per ton at all speeds. It follows that the kinetic energy available for retardation is

$$\frac{F_n}{F} \times 0.5 \frac{1.1W}{G} V^2$$

TABLE I.

Retardation ft. (per sec.)²	Retarding Force Lb. per ton	Track, Wind and Motor Friction Lb. per ton	Force available for Regen. Lb. per ton	Available K.E. Total K.E. Per cent.
1	76·5	15	61·5	80·5
2	153	15	138	90·3
4	306	15	291	95

TABLE II.

Retardation ft. (per sec.)²	Retarding Force Lb. per ton	Track, Wind Motor and Brake Friction Lb. per ton	Force available for Regen. Lb. per ton	Available K.E. Total K.E. per cent.
1	76·5	100	—	—
2	153	100	53	34·7
4	306	100	206	67·4

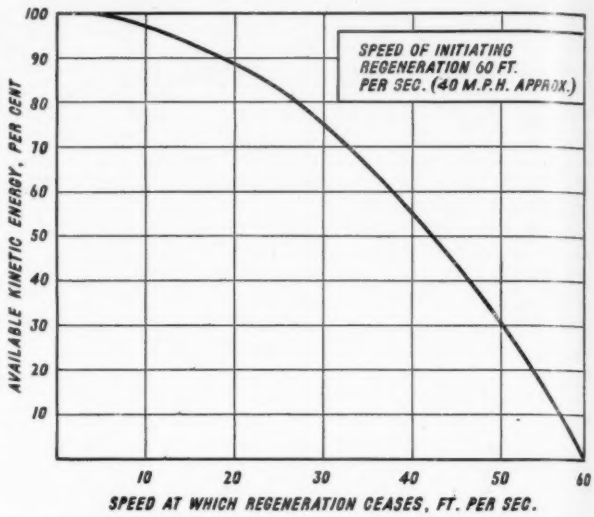


Fig. 1—Relation between kinetic energy available for regeneration and speed when regeneration ceases to be available

where F_n is the net retarding force apart from the various retarding frictions. Table I shows the importance of the above, and indicates the desirability of working to high retardations, as with any system of regeneration the amount regenerated must be a function of the kinetic energy available. If a mechanical brake and regeneration are used at the same time, the effect, so far as energy available for regeneration is concerned, is to substitute the friction figure of 15 lb. per ton to one of up to 100 lb per ton.

In Table II is shown the effect on the kinetic energy available for regeneration if 85 lb. per ton mechanical braking is combined with regeneration. An examination of Tables I and II shows the desirability of regeneration exerting not only a fairly high retarding effort, but an effort sufficient to meet service conditions unaided by mechanical brakes over the range of speed during which it is operative.

The speed over which regeneration is effective varies with the regenerative system adopted, and it is desirable to have a clear view of the effect this range of speed has on the kinetic energy available for regeneration. In Fig. 1 the percentage theoretical kinetic energy available for regeneration, assuming that regeneration is initiated at a track speed of 60 ft. per sec., is plotted against speeds at which regeneration ceases to be available. The curve is plotted on the assumption that regeneration supplies the full retarding force during the regenerative period, and that the regenerative system is 100 per cent. efficient.

The curve shows that while it is desirable to maintain regeneration down to the lowest possible speed, considerable kinetic energy is available even if regeneration is operative only over the higher speed ranges. For example, if regeneration is available down to one-third full speed, almost 90 per cent. of the total kinetic energy is available.

No system of regeneration is acceptable that does not also provide a suitable motoring characteristic. Therefore, in compiling the desired characteristic, motoring as well as regeneration must be considered. The operation

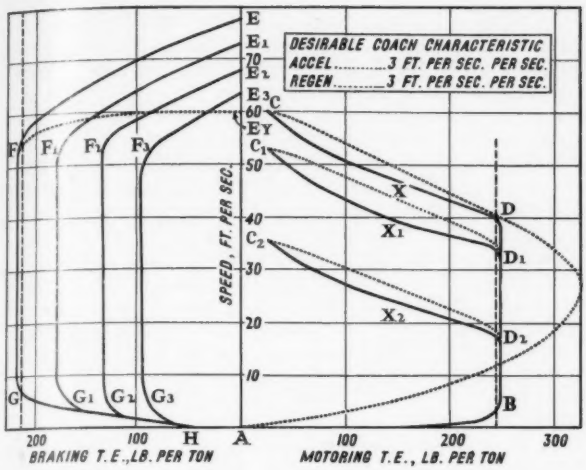


Fig. 2—Curves showing ideal characteristics

of lifts has shown that human discomfort is not caused by the value of acceleration, but by the rate of change of acceleration. On this assumption the acceleration curve, it plotted on the vehicle characteristic, Fig. 2, will approximate to the form *AC* between zero speed and balancing speed. With this type of curve the maximum acceleration is far in excess of the average acceleration and generally results in difficulties due to inadequate adhesion and greater heating of the motor, apart from possible commutation troubles. The ideal type of curve, therefore, becomes a constant acceleration curve provided with a gradual entry, see *ABD*, Fig. 2. The portion *CD* is retained to reduce gradually the acceleration up to the balancing speed. The driver must have lower speeds available and the characteristics represented by the curves D_1C_1 D_2C_2 are available at the will of the driver.

If motors are to be run in multiple-unit they must share the load within reasonable limits. Current-speed

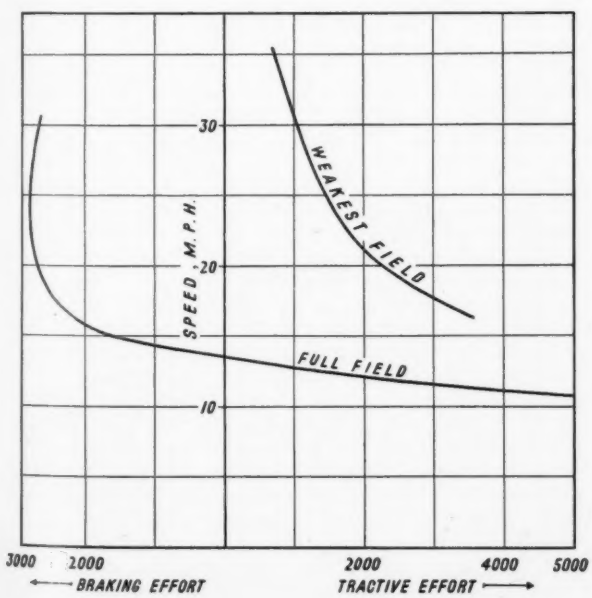


Fig. 3—Typical performance curves of compound motor

characteristics of motors may vary plus or minus 2½ per cent., *i.e.* motors may vary by approximately 5 per cent. on the tractive effort-speed characteristic. New and worn wheels may introduce a further difference of roughly 5 per cent., and the total difference between cars thus may amount to over 10 per cent.

A curve sloping as *CD* will cause an amount of balance of loading of roughly 20 per cent. for the above 10 per cent. overall variation, and therefore should be as vertical as possible, allowing for a smooth transition from the desired high acceleration value to the balancing speed. A form such as $D \times C$ is the ideal form. The horizontal nature of portion *AB* is of no importance, as any out of balance for so short a period of time is of no consequence. For similar reasons the regenerative characteristic should have a graduated but rapid entry *EyF*, corresponding to *AB*, and a graduated but rapid termination *GH*.

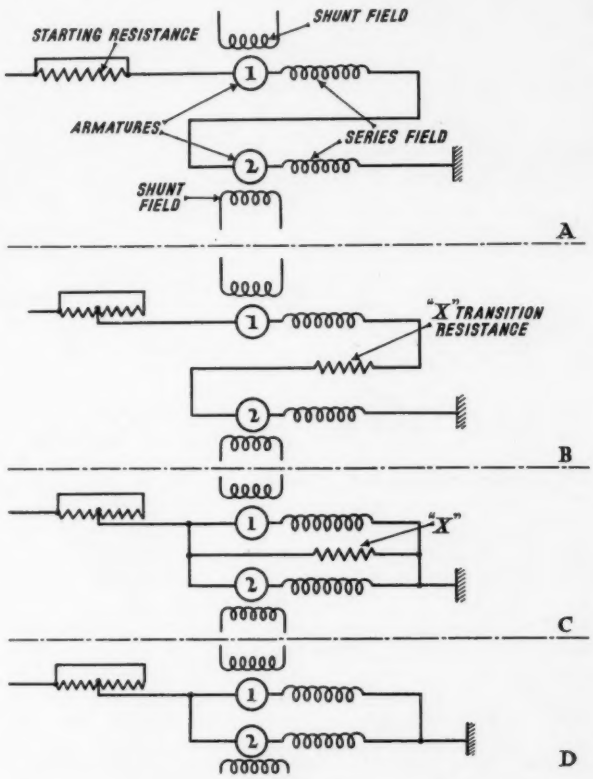


Fig. 4—Series-parallel transition scheme for two compound motors

The driver must be able to introduce regeneration from any reasonable speed when coasting. Thus the portion *FE* must slope upwards to speeds above the balancing speed. The driver must also be able to regulate his regenerative retardation effort for control on down grades. This, and entry into regeneration at speed below balancing speed, demand a number of curves, E,F,G,H,E_2,F_2,G_2H and E_3,F_3,G_3,H. The desired curves are shown as full lines on Fig. 2.

Compound Motor Characteristics

The trolley-bus motor is generally subjected to much more severe abuse than any other form of traction motor, yet for such a service the compound motor is as popular and as serviceable as the straight series, and has been adopted by the London Passenger Transport Board as standard. Fig. 3 shows a typical trolley-bus motor characteristic.

Series-parallel control is not usually adopted for trolley-buses but is desirable on railways, and as such control in conjunction with compound motors has been used in tramway systems there is no reason to consider the transition from series to parallel a difficulty on a railway system where semi or full automatic control is adopted. One type of transition used is illustrated in Fig. 4. The different sections, *A,B,C,* and *D* of this illustration indicate the following conditions:—

A.—The two motors are in series, with resistance cut out and with weakened shunt fields.

B.—The first step of the transition is to insert a suitable value of starting resistance for first parallel, to introduce a small section of resistance in the series connection and to strengthen the shunt field.

C.—The motors are now connected straight away in parallel, and the resistance *X* carries any circulating current that may exist, and a short circuit of the motor is avoided.

D.—First parallel is obtained by cutting out the series connection.

In Fig. 5 a typical compound motor characteristic has been plotted as a performance curve, *i.e.*, speed against

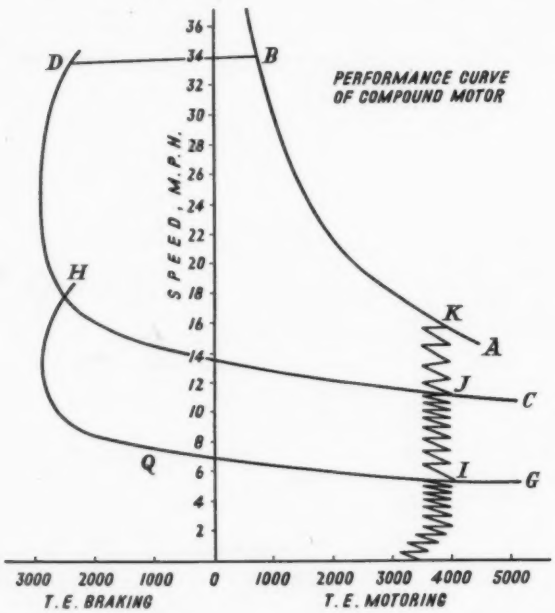


Fig. 5—Typical characteristic with compound motors

tractive effort, and curves for two motors in series introduced, *AB* being the weak field curve with one motor across the line, *CD* the full field curve with one motor across the line, and *GH* the full field strength curve with two motors in series across the line.

The introduction of a sufficient number of steps to reduce notching variations to a negligible ripple is a simple matter with any modern multi-notch control. With simple control such an equipment produces the performance curve *XIJKB* (*B* is assumed the normal balancing speed). Similarly, on the regenerating side the curve *BDH* is obtained by multi-notch field control. By comparison with Fig. 2 it will be seen that the ideal performance curve has been obtained, with the exception of the lower speed retardation. This results only in a small loss of regenerated energy, as has already been explained.

Opinions have been expressed that compound motors are not suitable for multiple-unit operation, but consideration of Fig. 5 wili show the fallacy of this view. With automatic acceleration the sharing of load during the acceleration period is exactly similar to ordinary series equipments. During the period the motor is across the line the compound motor characteristic, without any control, is almost identical to a series characteristic. At the higher speeds approximating to balancing speeds the motor is almost a pure series motor.

For regeneration in multiple-unit the characteristic is almost ideal, due to the automatic limiting of the retardation force (or back tractive effort) caused by the series turns of the field. The curves are at least equal to, if not better than, the average regenerative curves of well-known systems used with series motors.

The control of a compound motor is simple. The automatic control during the acceleration is easily provided on the multi-notch principle by means of a servo-motor or air-driven cam group, and to obtain regeneration it is only necessary to provide suitable backward control of the cam group for the regenerative control and certain additional protection against over voltages, which are common to all regenerative schemes. Without a great deal of further complication a form of rheostatic braking can be added but this is not recommended, since the wear on brake blocks is not greatly reduced and the air brake is ideal for the final stopping of the train at an exact spot, which is a requirement for most urban and suburban services. Further, a limited use of the shoe brake tends to prevent flats forming on the wheel treads.

Of the other methods of obtaining regeneration with motors the best and most extensively used at present is a system using a separate exciter during the regeneration period. In some cases one driving motor functions as the exciter. In certain cases motor-generators are used; these may be of a special characteristic and may transform the total energy, or they may be used as boosters. There are not many examples of this type, and it cannot be said to be well established up to the present.

Conclusions

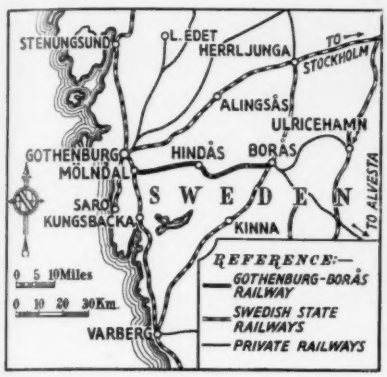
The compound motor is in every way suitable for regeneration on urban and suburban traction services. In conjunction with multi-point control equipment the performance curves both in motoring and regenerating are almost ideal, the only disadvantage being the loss of regeneration at low speeds. This only represents a very small loss of energy. In other systems, the control equipment has to carry out a change of connections before regeneration can be introduced. This means that regeneration takes a certain time to come into operation.

In many other systems, the voltage has to be adjusted before regeneration takes place. In the case of the compound motor, a slight strengthening of the field gives regeneration, with no other alteration in the power connections and without even disconnecting the motor from the line. The compound motor, even assuming that a small exciter has to be used for the shunt fields, requires less auxiliary equipment and control gear than any other form of regeneration, and the control equipment is not much more complicated than an ordinary series-parallel equipment. The popular idea that it has not a suitable form of characteristic for multiple-unit work is not quite right. Actually, in some forms of regenerative systems using special motor-generator sets, the compound motor characteristic is introduced. It is agreed that, as in the case of any new equipment, some difficulties exist, but it is considered that all these can be overcome by careful development.

THE GOTHENBURG-BORÅS RAILWAY ELECTRIFICATION

By

C. HAMILTON ELLIS



Map of Gothenburg-Borås Railway

1,600 h.p. bogie locomotive with individual axle drive

PROPOSALS for the electrification of the privately-owned line from Gothenburg to Borås were mooted for some time before the actual decision was made in March, 1934. The conversion work took just over two years, and an electric service over the 45 miles from Gothenburg to Borås—comprising the whole of the company's line—began in May, 1936. The track mileage electrified is 55, all equipped with the standard 16-kV. 16⅔-cycle single-phase system as used on the Swedish State Railways, over which the G.B.R. exercises running powers into Gothenburg Central. The company is included in the Gothenburg-Småland-Carlskrona Traffic Union, forming a link in the direct route from North Sea to Baltic *via* Alvesta, Växjö and Emmaboda.

The total cost of electrification amounted to 3,800,000 kr. (£190,000), made up of 1,100,000 kr. (£55,000) for the overhead equipment; 1,800,000 kr. (£90,000) for the locomotives; and 900,000 kr. (£45,000) for the converting and miscellaneous equipment. After allowing for interest on capital and deducting all maintenance charges for the stationary equipment, the annual saving is about 150,000 kr. (£7,500); the actual saving resulting from the lesser staff required, the dismantling of the coaling and watering stations, and the saving in the fuel bill totals approximately 210,000 kr. (£10,500) a year.

Energy is supplied by the State hydro-electric grid to a mobile converter plant normally stationed at Sjömarken. This substation comprises a single converter and transformer with a continuous rating of 2,400 kVA., and an overload capacity of 100 per cent. for short periods. A second converter plant is being installed as a spare and to cater for any future increase in traffic or for the electrification of any neighbouring lines. At the moment, however, there is no programme of electrification for the adjacent Borås-Alvesta Railway, with which the G.B.R. maintains a close working agreement. The single contact wire is of copper with an area of 80 sq. mm., and is supported through stringers by a seven-strand catenary with a cross-sectional area of 50 sq. mm. The usual distance between the masts on straight track is 60 m. (196 ft.), and there are tensioning weights giving a pull of 1,000 kg. (2,200 lb.) spaced at intervals of 1·5 km. (1,640 yd.).

A considerable difference exists between the mechanical design and electrical equipment of the G.B.R. electric locomotives and those of the Swedish State Railways. As the Borås line more or less follows the contour of the land, and has frequent curves, and grades up to 1 in 80, a double-bogie four-motor design was selected in preference to the State Railways' standard 1-C-1 type. In steam locomotive days a maximum axle load of 14 *tonnes* was permitted, but with the reduction in the unsprung weight and the elimination of the hammer blow, the permissible maximum has been raised to 17 *tonnes*. Trials made to determine the tractive efficiency of these 67-*tonne* Bo-Bo locomotives showed that despite the transfer of weight between axle and axle, and the effect of the drawbar reaction, a tractive effort of 18 *tonnes* (39,600 lb.) could be attained on a dry rail without slipping. Each locomotive has four 400 h.p. motors, and dead-man control is incorporated. The nine locomotives, which supersede 16 steam locomotives, principally of the 4-4-0 and 2-6-2T types, were built by the Motala Works and by Nydquist & Holm, the electrical equipment being supplied by Asea.

Both freight and passenger trains are worked by these locomotives, which are all to the same design. The freight trains are limited to 700 *tonnes*, and the passenger trains, including the Småland Express, to 300 *tonnes*. The journey times have been cut down since electrification, and the schedule for non-stop trains from Gothenburg to Borås is 66 min. One minute more is allowed the Småland Express, which has a restaurant car for Alvesta, as it makes an intermediate stop at Hindås. Electric heating has been fitted to about 60 carriages, inclusive of stock belonging to the Borås-Alvesta Railway, which work through to Gothenburg over the G.B.R., and these, together with other vehicles running also on steam lines, have a dual equipment for steam and electric heating.

INNSBRUCK RUNNING SHED AND REPAIR SHOP

The main depot for the western section of the Austrian Federal Railways

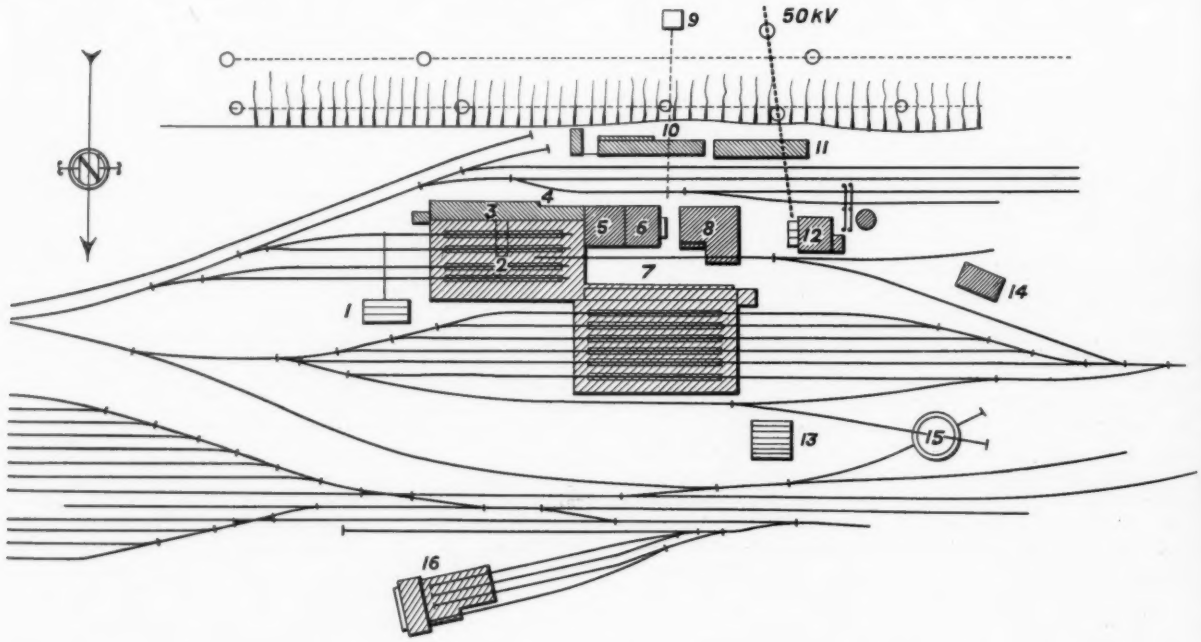
✱

FOR the 390 route miles of the electrified Austrian Federal Railways to the west of Salzburg there are three electric locomotive running sheds. They are, from east to west, Salzburg (built in 1929), Innsbruck (1923), and Bludenz (1925). Salzburg running shed provides the electric locomotives for the slow passenger and goods trains from Salzburg to Wörgl, and for all kinds of trains on the 50-mile Tauern line from Schwarzach-St. Veit to Spittal-Millstättersee. Bludenz running shed supplies the electric locomotives for all local, slow passenger, and goods trains in the Vorarlberg, as well as for some of the fast trains to and from Innsbruck.

The shed at Innsbruck provides the electric locomotives for nearly all the international express trains from Salzburg to Buchs (Swiss frontier), for experience in Austria and elsewhere has shown that long runs of locomotives can be done most economically from a running shed located near the middle of the line. In addition to supplying the power for the international trains, Innsbruck running shed, with the sub-shed at Wörgl, provides power for the local traffic in the Tyrol, for express, slow passenger and goods trains on the 21-mile Mittenwald line from Innsbruck to Scharnitz, and finally for all kinds of trains on the 70-mile transit line from Kufstein (German frontier) to Brennero (Italian frontier). Although transit traffic from Germany to Italy and *vice versa* on this line is not as heavy as on the Gotthard or other Swiss routes, Innsbruck shed has to provide 20 heavy goods engines a day in spring and autumn for the section from Innsbruck to Brennero, which has a length of 23 miles and a maximum gradient of 1 in 40.

Overhead line repair wagon. This vehicle is equipped with electric drive, but has also a petrol engine for use when the contact line is dead

The total number of electric locomotives allocated to Innsbruck running shed is 72, of which 29 are heavy 1-Do-1 express engines (Series 1670), 15 are Bo-Bo mixed traffic engines (Series 1170, 1170.100, 1170.200), 9 are heavy articulated 1-C-C-1 goods engines (Series 1100, 1100.100), 11 are C-type shunting engines (Series 1070 and 1070.100), 4 are E-type goods engines (Series 1080, 1080·100) and 4 are the old heavy type of electric



1 Locomotive wheel stock
2 Locomotive erecting shop
3 Electrical repair shop
4 Motor repairs
5 Turning shop
6 Smithy
7 Wagon repair shop
8 Stores
9 Water tank
10 General stores
11 Carriage & wagon repairs
12 Power house
13 Carriage & wagon wheel stock
14 Lodgings for running staff
15 Turntable.
16 Repair shop for petrol-driven vehicles

Layout of Innsbruck West electric locomotive repair shops

motor-coach (Series ET.10). The express engines of Series 1670 have individual axle drive through articulated couplings from vertical motors, each uncoupled axle being mounted with the neighbouring driving axle on a bogie. The total weight amounts to 104 *tonnes*, with a maximum axle load of 17·5 *tonnes*; the top speed is 62 m.p.h. The driving motors have an individual hourly output of 262 kW. and a continuous rating of 204 kW. The standard type of mixed traffic locomotive, Series 1170, has individual axle drive of the well-known Sécheron construction, with a hollow quill and spring drive on the wheels. The total weight amounts to 80 *tonnes*, and the axle load to 20 *tonnes*; the top speed is 50 m.p.h. The driving motors have an hourly output of 400 kW. each and a continuous output of 332 kW.

The monthly performance of Series 1670 amounts to an average of 7,500 miles per locomotive. That of Series 1170 averages 3,100 miles, and that of the heavy goods locomotives of Series 1100 amounts to 4,400 miles. In a typical summer month a total of about 330,000 miles are run by the 70 electric locomotives at the shed, including about 15 per cent. of this number under repair.

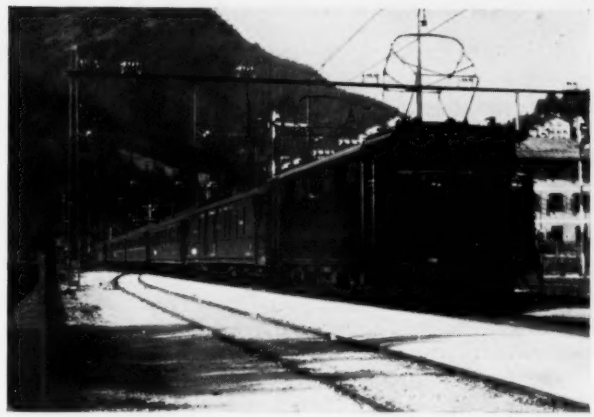
When comparing these mileages with the running performances on the electrified lines of other main-line railways in central Europe, *e.g.* the German State or the Swiss Federal Railways, one has to consider the much more unfavourable gradients, curves and operating characteristics on the Austrian lines west of Salzburg. For example, the 266-mile east-to-west main line from Salzburg to Buchs has three heavy gradients: from Saalfelden to Hochfilzen (11 miles at 1 in 45); from Kitzbühel to Kirchberg i. Tirol (5½ miles at 1 in 62); and the Arlberg line from Landeck to St. Anton (17½ miles at 1 in 39-40). In the other direction the gradients are even steeper, as the western side of the Arlberg line, from Bludenz to Langen, has a length of 15½ miles and a maximum gradient of 1 in 33.

The staff employed at Innsbruck running shed comprises:—

Supervisory and clerical	57
Drivers and assistant drivers	233
Workers in the shed	85
Workers in the repair workshop	321
Total	696

The whole depot comprises two parts: the repair shop at Innsbruck West station and the engine shed close to Innsbruck main station. The locomotive shed has 21

West-bound Bucharest-Paris train hauled by a 1-*C*-*C*-1 *locomotive piloting a* 1-*Do*-1 *machine*



East-bound Arlberg-Orient express at St. Anton, hauled by 1-*Do*-1*-type locomotive*

stands, all equipped with overhead electric contact wires. The electrically-driven turntable is situated in the centre of the shed. Locomotives returning to the shed after being in traffic are equipped there with sand and lubricants.

Repair Depot

The repair shop at Innsbruck West comprises an erecting shop with four tracks, and is equipped with all the usual machinery and overhead cranes; a repair shop for locomotives, a turning shop, a smithy, a joinery, a welding shop, a copper-smithy, a paint shop and an upholstery. The two last-mentioned departments are used mainly for the repair of carriage and wagon stock, as, owing to the great distance of the lines in the Innsbruck area from the Federal Railways main repair shops for carriage and wagon stock, the workshop at Innsbruck has to repair all the rolling stock running in that area. In addition, all the petrol-driven service vehicles used for inspection of the permanent way and the overhead equipment are repaired at Innsbruck.

Energy for light and power purposes is supplied from a transformer station fed by 15-kV. single-phase current and supplying three-phase current. The transformer station is situated next to the power house, in which are two boilers producing steam for heating purposes. The erecting and repair shops are heated by hot air which in winter can be blown into the inspection pits to melt quickly the snow and ice on vehicles which have just come in.

The following kinds of repairs are carried out at Innsbruck workshop. *Locomotives*: all periodical examinations, light and intermediate repairs, use being made of standardised and interchangeable parts in order to reduce the time under repair. Heavy repairs of traction motors and transformers are generally done at Linz workshop. *Carriage and wagon stock*: light, intermediate and heavy repairs. *Petrol-driven vehicles*: complete overhauls and all other repairs.

Innsbruck shop has under its care 72 electric locomotives, 420 carriages, 162 luggage vans, 22 mail vans, 27 private wagons, 137 wagons, 10 tower wagons and 103 vehicles of the permanent way and overhead equipment departments. Further, any work necessary to carriages and wagons requiring repair as they pass through Innsbruck has to be carried out there, and this means miscellaneous repairs to about 3,000 wagons and 1,500 carriages a year.

NOTES AND NEWS

Warsaw Metro.—Further plans have been drawn up for a metropolitan system in Warsaw. Present proposals contemplate the construction of 35 route miles of line, 15 of which would be underground, during the next three decades or so.

Further Italian Electrification.—Electric traction over the Trieste-Campomarzio-Opicina line is to be inaugurated on October 28. This line forms the first part of the route of international trains from Trieste to Gorizia, Piedicolle, Villach, Salzburg, and Germany through the Karawanken tunnel.

New Italian Electric Railway.—It is expected that the new railway between Biella and Novara will be opened during the course of next year. This line, about 34 miles long, is to be worked electrically on the 3,000-volt d.c. system, and will be operated by the Soc. An. Ferrovie Elettriche Biellesi. It is being laid to the standard gauge and will have a maximum gradient of 1 in 50.

Rigi Railway Electrification.—Electric traction on the Vitznau-Rigi Railway was inaugurated on October 3, when the winter time-table came into force. Two of the three motor-coaches had then been delivered, and the third has since been placed in service. The most recent class of steam locomotives is being retained for use during peak periods. Electrification of this line was announced in our issue of May 29, 1936, and further details were given on p. 646 of the October 16, 1936, issue.

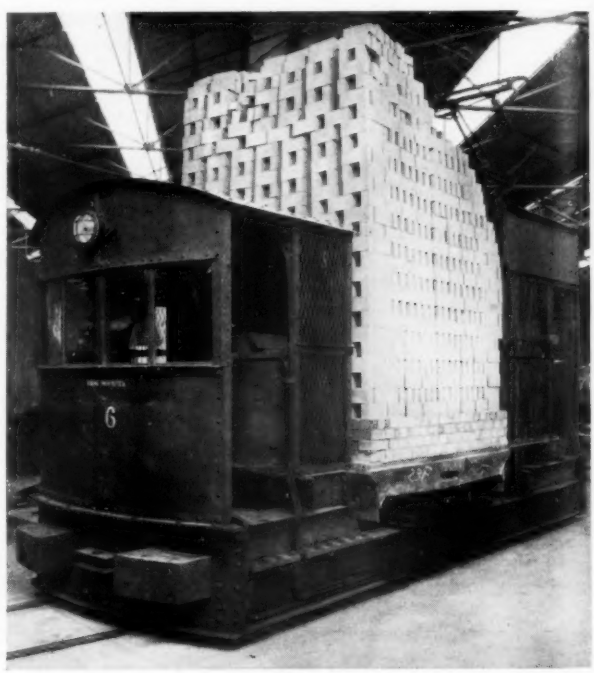
Switchgear & Cowans Limited.—A new brochure has been issued by Switchgear & Cowans Limited showing the distribution of its internal isolation switchgear in Great Britain. The front cover of the brochure is in the form of a map on which are marked the locations of different S. & C. switchgear installations, from Aberdeen in the north to Bournemouth in the south. At the moment, there are almost 3,000 panels in 870 substations in the service of 134 different supply companies.

New Swiss Trains.—The two three-car light-weight electric trains ordered by the Swiss Federal Railways 18 months ago are to go into traffic this month. These trains are non-articulated and have a motor-coach at each end and a trailer in the centre, which provide seating accommodation for 32 second class and 160 third class passengers. The tare weight is 116 *tonnes* and the top speed 93 m.p.h. On the one-hour rating, the aggregate output of the eight traction motors is 2,350 h.p. at 71 m.p.h.

Italian Cable Railways.—Mr. A. M. Hug tells us that since he wrote his article on the two latest Italian cable railways, published on p. 503 of the issue of this Supplement for September 17, a decision has been reached to carry the Matterhorn line still higher, from the Theodule Pass to Testa Grigia, which lies 10,250 ft. above sea level. A detailed description of the second cable line described, that from San Remo to Monte Bignone, can be found in the Swiss journal *L'Allegement dans les Transports*, numbers 3-4 and 5-6 of this year.

Electric Transfer Cars.—Six electric transfer cars have been placed in commission at the Stewartby works of the London Brick Co. Ltd. to transfer loads of bricks from one set of rails to any other set at right angles. Each car is propelled by two B.T.-H. 20 h.p. d.c. motors running at 650 r.p.m. at 220 volts. These motors are located vertically and run in ball and roller bearings; they are of the series wound, commutating pole, reversing type, and are totally enclosed to provide complete protection from the grit and dust in which they operate. Current is collected by a single pantograph mounted on the roof of the driving cabin at one end, and electric lighting is fitted.

Standard tramway controllers of the B.T.H. series-parallel type, with rheostatic braking, are used for the control of the propelling motors, and, in addition to the usual B.T.-H. unbreakable type of accelerating resistances, an additional section is provided to give creeping speed in order to secure accurate stopping of the cars opposite the junction of the adjoining rails, which are at right-angles to the running rails. This is also facilitated by the provision of a push-button operated contactor panel on each car. Two push-buttons marked Forward and Reverse are mounted in a conveniently accessible position on each side of the car. On a car approaching the point on the track where it is required to discharge the load at right angles, it is possible for the operator to leave the driving position,



A brick transfer car with B.T.-H. equipment in operation at Stewartby brick works

walk to either side of the car and resume complete control at a creeping speed in either direction of motion by means of the push-buttons. Each push-button operates a 5-pole contactor, which in effect duplicates the contacts which would normally be closed in the controller on the first notch, thus reproducing the effect of inching the car on the first notch.

Complete electrical interlocking is provided to ensure that the manually-operated controllers are in the off position before the push-button control is rendered effective. When the car has been accurately stopped, current is applied to a 5 b.h.p. racking motor, which operates a device for traversing the load (approximately 15 tons) on to the adjoining line.